DOES YOUR ANTI-VIRUS REALLY WORK?
Top security suites lab-tested with live threats

COMPUTER SHOPPER
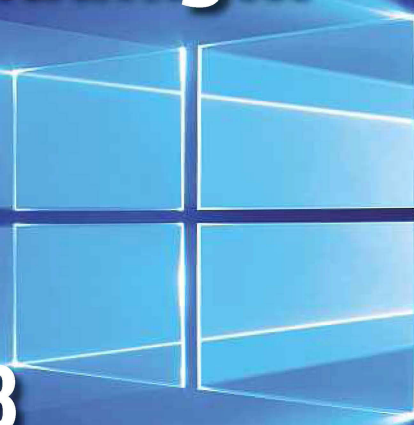
MAKE
Windows 10
BETTER

35 tips, tricks and guides, including...

+ **Essential keyboard shortcuts**
+ **Secret features**
+ **Fix OneDrive**
+ **Activate God mode and more - p98**

Greatest tech failures

So many products fail to live up to the hype or even their own promise. We find out why - p126

Surface Pro 4

Throw away your desktop, laptop and tablet – this really is the ultimate hybrid

BlackBerry Priv

Can BlackBerry's first Android phone save the company?

Welcome!

DID YOU KNOW that Windows 10 has a built-in desktop recording application? That you don't have to use Bing to make Cortana searches? That you can use the Start menu to do calculations and convert between units? Neither did we, until we started putting together this month's feature. Starting on page 98, we show you all our favourite Windows 10 tips and tricks, so you can use the operating system more efficiently and make it work just the way you want.

Some products live up to the hype, while others are over-hyped but still sell by the bucket-load (here's looking at you, iPhone). Others, however, show promise but for a variety of reasons fall by the wayside. This month we look back at the innovations that just didn't make it, and try to work out why they failed. Check out the ones that got away on page 126.

Charles Holland Duell, commissioner of the United States Patent and Trademark Office in the late 19th century, is famous for apparently saying "everything that can be invented has been invented". This quote is most likely apocryphal, but suits this month's feature perfectly, where we show that everything from the selfie stick to the electric car was invented long, long before you thought it was. Join us for a technology history lesson from page 118.

There are many ways a malware infection can spoil your day. From making your PC unstable to locking out your files and sending your personal data to criminals, catching a virus really is something to be avoided. Even if you pay for a commercial security suite, can you be sure it's keeping you safe? In our group test this month we've taken the top free and commercial anti-virus programs and subjected them to live virus threats, to see which nasties were neutralised and which were let through. Find out if it's time to upgrade your AV on page 78.

Chris Finnamore, Editor
chris@computershopper.co.uk

QUESTION OF THE MONTH

MEET THE TEAM

Our famously hard-to-please Product Editor Tom is leaving after 60 issues. What product has impressed you least in the past five years?

Chris Finnamore
"The disconnect between hype and reality for Elite Dangerous was devastating"

David Ludlow
"Every single Apple product. Just kidding!"

Katharine Byrne
"The Amazon Fire Phone. Great in theory, but a terrible mess in practice"

Richard Easton
"No heart-rate monitor is big enough for my chest"

Seth Barton
"How Motorola and Google conspired to make something as mediocre as the Nexus 6 still baffles me"

Tom Morgan
"I have yet to be impressed by a product"

Michael Passingham
"The GT Omega racing cockpit because I couldn't fit it in my house"

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6 FULL PACKAGES

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Letters

Microsoft may claim that Windows 10 has been a success, but for many *Shopper* readers it's been a source of frustration and anger – and has even sparked the return of the dreaded Blue Screen of Death

EULA CANNOT BE SERIOUS

I, like many, waited eagerly for the release of Windows 10 and got it at the start of August. I decided to try it out on my living room PC first and noticed the strange privacy options during setup, which I altered (I hate advertising on my PC). After a few hours I decided I didn't like it (ugly, Edge is useless, not as snappy as 8.1 on my device, I have no use for Cortana and some legacy devices I have may not work). As a result my two other PCs (my home music studio PC and laptop) have remained on Windows 8.1 and 7 respectively.

I followed the debate over privacy and the inclusion of telemetry to Windows 8.x and 7, and noticed that my music PC started to have latency issues that didn't exist before and my laptop seemed buggy after having been rock solid for years. As a result I have now pruned back Windows Update to allow only important updates on the laptop and have disconnected the studio PC from the internet to get back to a usable system.

Now, the only PC that was updated to Windows 10 (and then rolled back using Windows 10, not an image) doesn't hassle me about upgrading the way my other two PCs did/do. This has led me to a question. Microsoft seems happy for users to roll back to Win 8.x or 7 after trying Windows 10, and the push to include it as a recommended update seems slightly dubious. I wonder that if you accept the EULA for Windows 10 (giving Microsoft enormous reach to your personal data) if this is then tacit consent and essentially replaces the EULA for 7 and 8.x when you roll back.

Stuart Mitchell

It's an interesting question. We've asked Microsoft's press office (and tweeted Gabe Aul, VP of the WDG Engineering Systems team), but have yet to receive a response.

EULA aside, if you're worried about unintended consequences when installing Windows 10, such as it not rolling back cleanly, you can take some steps to protect yourself. You can make an image of your hard disk using a utility such as Macrium Reflect Free (*macrium.com/reflectfree.aspx*) before you upgrade, then restore from that image if you don't like Windows 10 (having backed up all the files you created since).

You could also recover your Windows product key with a utility such as Nirsoft ProduKey (*nirsoft.net*), then reinstall your previous version of Windows from scratch using the installation media available from Microsoft's website; this will wipe all your files and programs.

WHY ARE WE WAITING?

After the debacle that was Windows 8 with the slight improvement provided by Windows 8.1, I was really looking forward to getting Windows 10. With all the hype and pre-release coverage in your and every other magazine and periodical I thought it would be a real step up for Microsoft and their private customers (businesses always seem to be two versions behind!).

I had upgraded my laptop and desktop with SSDs, which gave me much-improved bootup and general performance speeds, and was expecting even more with Windows 10.

Shortly after updating my laptop and after the magic date

★ Star letter

UNWANTED EXTRAS

I recently purchased a Lenovo Tab 2 A10-70F from my local Argos. Great machine, but with an unwelcome extra.

As I've been careful with computer systems for years, always ensuring they are as secure as I can make them, one of the first tasks on connecting via Wi-Fi was to visit the Sophos website for the link to its free anti-virus software for Android devices.

Having installed it on my tablet from Google Play, the first scan revealed Trojan Andr/Fakeins in an app called Gameplay. Naturally, I used Sophos to uninstall the app immediately. I also used Sophos's option to scan for apps of poor reputation, and uninstalled them also.

I subsequently visited both the Argos and Lenovo websites to inform them of what I'd found, but neither site had a simple means of reporting problems.

Unfazed by the virus I have no intention of returning the tablet, but many other customers accept goods as they come from the box. My recommendation is never assume a new device

⬆ It's worth checking for malware even on a new device

is clean and always install AV software as soon as possible after purchase and run a full scan.

David Francis

That is worrying. It seems that Andr/Fakeins is a method of wrapping free games in adware, so they nag you to pay to advance through the game. We're amazed Lenovo is preinstalling this on tablets, so soon after the Superfish laptop malware debacle. It looks like Android tablets aren't immune from the scourge of malware, so to be on the safe side it's worth running a reputable virus scanner.

of 29th July I inadvertently clicked on a link which I thought was taking me to the Windows 10 download area. Was I wrong! It loaded so much rubbish on my laptop I eventually decided that a clean install from my Windows 8.1 disc was the only option. That went well, but it took two weeks to download and install all the Windows updates to get back to where I was before, and I am still doing it!

Am I disappointed? Not really. I get *Computer Shopper* every month and avidly read any information regarding Windows 10, and I'm rapidly coming to the decision that I don't want it. However, I keep all the relevant issues in case it does materialise and I need all those tweaks and fixes. But I would really like to know why some people (me) have had to wait so long.

Congratulations on the magazine. I enjoy the coverage of other techy items, especially Zygote's sideways look at the world and David Robinson's computing in the real world.

Martyn Hole

It sounds like you fell victim to a scam site pretending to offer Windows 10 downloads. If you do want to download Windows 10, make sure you go to the official Microsoft download site at *www.microsoft.com/en-gb/ download/windows.aspx*.

We agree that it's a bit strange how long it takes for the official upgrade to appear in your system tray; we have a couple of PCs here where we're still waiting. This is usually caused by the PC missing the requisite packages: there's a good support article with more details about this at *support.microsoft.com/ en-gb/kb/3081048*.

OOPS!

I am just reading Issue 335 of *Computer Shopper*, and found a problem in the article on page 52 ('How to extend your wireless range'). In the Quick Start Configuration section, it suggests setting the IP address of the AP-900 to 192.168.1.254, saying that "this is highly unlikely to clash with anything on your network".

I beg to differ. 192.168.1.254 is the default gateway address for every BT Home Hub, in all versions from 1 to 5. Given that several million people are BT customers, this is likely to cause problems for a lot of readers.

Alan Danbury

You're absolutely right. Unfortunately, the dozens of routers the writer had tested over the years all had 192.168.0.1 or 192.168.1.1 IP addresses, but BT (and its subsidiary Plusnet) is an exception. If you have a BT or Plusnet router, make sure you use an address for the extender that doesn't clash with your router.

NON-INFINITE SPACE

Following your review of Windows 10 laptops (*Shopper* 334), I bought two Asus X205TA laptops: one for my son to do homework and the other for my mum to replace a failing Acer Aspire for web surfing and emails.

I have been trying to upgrade them to Windows 10 but have

hit a problem: shortage of disk space. The Asus X205TA is sold as having a 32GB SSD but Windows reports its capacity as 18.8GB (as alluded to in your review). However, only around 6.5GB is free before apps and personal data.

According to Microsoft the upgrade needs a minimum of 8.5GB on the C drive. I have connected a large flash drive which is recognised in the setup/installation program but it still asks for more space on C. As far as I can see the only way to get the missing couple of GB is to remove parts of Windows. How did you manage to upgrade your test X205TA?

During one upgrade attempt a Windows file got corrupted, and after a conversation with Asus support it turns out that there is no retrievable licence key with this netbook, so a clean install is not possible; their only solution was to send it back. Have you heard of this and is it now common practice? If so, I think it ought to be far more obvious in the product ➲

description/review. Luckily as I have two models I did a restore drive on the second one to fix the first, but that is hardly a common solution.

Mat Smith

It is odd that you have so little free space on the X205TA's storage; we can't remember exactly how much our test laptop had out of the box, but it was certainly more than that. Before you run the upgrade, we'd recommend running the Disk Clean-up utility (search for 'Disk' in the Start menu).

If you still don't have enough space, it's worth downloading Windows 10 as an ISO file from *www.microsoft.com/en-gb/ software-download/windows10ISO* to a flash drive, then running the installer from there; this means the large Windows setup files won't be on your C drive, freeing up valuable space.

WINDOWS 0/10

I am writing to vent my anger at the farce that is Windows 10.

Having performed the upgrade from Windows 7, my computer became unstable, failed to do updates, various processes stopped working – including Windows Defender – I had a whole array of different Blue Screens of Death, and messages saying it had not shut down properly when I know I had shut it down the right way.

In the end, I contacted your *Helpfile* and various suggestions were made, including anti-virus and malware scans and memory checks. One AV scan showed up what was described as a Trojan: HEUR.win32.generic and the infected file was C:\Program Files (x86)\Tool_mini\3849621. exe. Despite quarantining it, the instability continued.

I then followed an earlier piece of advice from *Helpfile* (foolishly, I now feel), bit the bullet and performed a clean install from a DVD created on my laptop to ensure there was no contamination. I undertook this on 14th November. What a complete waste of time that has been.

I spent a whole day installing Windows 10 and MS Outlook. I'm still in the process of re-installing my software (Microsoft Flight Simulator X with the drivers for my various controls proving the most problematic) and getting the settings for all my programs back how I want them, and I have changed all my passwords. It took nearly a week to get my Livedrive backups on track as Livedrive said I was using a second computer.

The BSODs resumed on 18th November and I am still getting various processes and updates failing, and reports of Windows not shutting down properly. The final straw today has been doing Cumulative update for Windows

10 version 1511 for x64-based Systems (KB3118754), which repeatedly says it has failed and undoes the changes quoting error 0x800F0922. I searched the Microsoft website and found no record of the update or the error code. What is going on?

I am beyond angry. How can Microsoft put out something so useless? I suppose that this is what one must expect for something that is free. Have I been singled out by Microsoft for some punishment? Am I alone in these experiences?

Richard Sanders

How horrid. We haven't had any such blue screens with Windows 10, and have installed it on many different machines. It sounds as though there may be a hardware problem with your machine; we find memory is often a cause of random failures such as these. To test your RAM, click Start, then type 'memory' and select the Windows Memory Diagnostic. This can restart your PC and run a thorough memory test to check for any errors.

The update error 0x800F0922 may be to do with installing the .NET Framework 3.5. There is an alternative way; you can install .NET through the Windows Features application. Click the Start button and type 'Windows features', then select 'Turn Windows features on or off'. Tick the box next to .NET Framework 3.5 and click OK. **CS**

NEXT MONTH

ON SALE in newsagents from 14th January

❯ THE SNOOPER'S CHARTER

The government is trying to introduce legislation to make ISPs and phone companies keep hold of your browsing activity, email and phone records, among other information, for a year, and to give the security services the power to access them. In a turbulent world, we ask whether this is a necessary infringement of our privacy.

❯ COMPACT PCs

They take up hardly any desk space, use little power and can even be screwed to the back of a monitor. We test the best mini-PCs.

❯ POWERLINE NETWORKING

We find out if sending network data through your home wiring is a viable replacement for running Ethernet cables.

❯ SOUNDBARS

Modern TVs have great pictures but terrible sound. Give your video the audio it deserves with a soundbar.

❯ SMALL IS BEAUTIFUL

Much modern technology is dependent on miniscule mechanical devices called MEMs. We celebrate the world's tiniest devices.

Contact killing

Have you heard the one about the priest, the high-roller and the targeted email scam?
David Robinson did, and it nearly cost one of his clients a four-figure sum

DAVID ROBINSON
Software and systems developer
letters@computershopper.co.uk

IT'S BEEN A while since I've written about money and clients' attitudes towards it. It can be murder trying to get them to part with it for things any reasonable mortal would regard as essential, yet they're frequently keen to splash wodges of the stuff on trivia that doesn't enhance their business at all. And when it comes to scams, even the most hard-nosed individual can fall for them in an unguarded moment.

Late last Thursday, Duncan's Aston Martin pulled up in the car park. His expression said that he wasn't happy. "What can we help you with?" I asked, hoping he hadn't found some new way of crashing his company IT system.

"I want to change my email address," he said. I asked why and he began his tale of woe.

Now, despite his worldly wise approach to business, Duncan's a religious man. "I got an email from our priest," he said. It appeared that the man of the cloth had travelled to Nepal to help with the recovery from the earthquake. He then suffered the twin misfortunes of falling seriously ill and losing his wallet. He needed a significant sum of money, said the message, in order to pay the hospital bill. So

> Clearly the email scam has evolved from the crude Nigerian prince-type to a smarter, more targeted approach

Duncan had gone to the bank, withdrawn a four-figure sum in cash and taken it to the nearest Western Union agency to transmit the funds to Nepal.

Duncan then decided to phone the canonical mobile to tell him the money was on its way. There was no answer. Ten minutes later the priest called back. "Sorry I couldn't answer," he said to Duncan, "I was taking confession."

"From a hospital bed in Nepal?" asked Duncan.

"No – in the church, as usual."

Now, you probably worked out around 10 sentences ago, as I did, that this was a scam. Duncan legged it back to Western Union and – possibly with divine intervention – stopped the transfer. Such transfers are usually irreversible, but in this case the time difference with Kathmandu meant they hadn't executed it yet. Is Duncan lucky or well connected? You decide.

HACK CLOTH AND ASHES

It looks as if somebody had hacked into the ecclesiastical email contacts list. This is a fairly well-known scam, but in this case the scammers appeared to have been very selective in picking their victims, as the few who received the plaintive message were all quite well heeled. Usually the fraudsters email everyone on the list, and the owner is soon bombarded with messages asking if the request is real. The selectivity of Duncan's scammer implied they had compromised not just the list but the message history and content too, and used it to identify the most lucrative potential victims.

Clearly the email scam has evolved from the crude Nigerian prince-type to a smarter, more targeted approach. Some electronic invoice scams purport to be from companies that clients have actually traded with, rather than a random, made-up company. Recently a client was nearly taken for almost £30,000. The book-keeper had received an email supposedly from her managing director ordering her to pay £27,463.77 to a new supplier with whom the MD had just negotiated to buy some materials at a special price. The offer was open for a limited time and the payment had to be made right away or another customer would get the stuff. She nearly made the payment but,

thankfully, phoned us and the MD before finalising the transfer. Like Duncan's scam, this attack implies a detailed knowledge of the company's affairs.

SOURCE OF MISTRUST

In both cases the scam messages appeared to come from someone the recipient would trust, but when you look at the raw message text, it's clear that the apparent sender and the true source don't match. This is a common characteristic of such scams, as the sender tries to disguise the fact that the transmitting computer isn't what the message says it is. I received a similar one last week, supposedly from UK domain registration company LCN.com. The message said that I'd ignored several emails sent to me saying that a certain domain (registered in my name with LCN) had been identified as a source of spam, and that as a result they were "suspending" the domain. Clue: I'd received no such messages. The domain wasn't even in use, and when I looked closely the message was actually from *lcn. au.com*. Did I click on the link that was supposed to invoke some resolution to the problem? Not likely. Instead I logged on to my account management screen at *lcn.com* and found – guess what? – no sign of trouble.

If the sender had made the mistake of altering the 'from' address to *lcn.com*, our spam filter would have bounced the message back because of the mismatch between the sender and source addresses. We offered to put the same filter on Duncan's company network. "How much is that?" he asked. "£20 a month," said Alan, who usually looks after Duncan's company requirements. Duncan's response? "Good grief, I'm not spending that much!"

An Aston Martin parked outside. Just nearly lost a four-figure sum. Go figure. CS

Who polices the internet?

Despite appearances to the contrary, the web is meant to be regulated, by a US-based organisation. **Gordon Holmes** questions whether it's doing its job properly

GORDON HOLMES
With more than 30 years of experience in law enforcement, our retired cop gives a police officer's perspective on the sticky subject of cybercrime
letters@computershopper.co.uk

CYBERCRIMINALS ARE COWARDS. I make no distinction between the various types: virus writers and distributors, DDoS merchants, database hackers, online banking fraudsters, website defacers, purveyors of counterfeit goods, espionage hackers – they're all cowards. They make full use of proxies, meaningless usernames and privacy settings in order to hide in the shadows and sneak around the internet furthering their criminal aims.

The motive for these criminal acts is not always monetary. Sometimes the aim is purely kudos, an increase in reputation among collaborators and underground forum members, but the general principle of anonymity remains universal.

Day after day the media report yet another data breach where customers' most sensitive financial details have been ripped from insecure servers and posted on the web for all to see. You'd be forgiven for thinking that the internet consists of a barely regulated Wild West town, where the bad guys rule the streets wearing masks to conceal their identity while the sheriff is nowhere to be seen.

> You'd be forgiven for thinking that the internet is like a Wild West town, where the bad guys rule the streets

In fact, there is a sheriff. The internet is governed by a central body, which allows all of us, criminals included, to use this resource via a complex system of self-regulating contracts. We all (and I mean all) pay a fee to gain entry to the cyberverse, which is controlled by the Internet Corporation for Assigned Names and Numbers, or ICANN.

You may be aware that the internet evolved from a project commissioned by the US Defense Department to provide robust communications in the event of a nuclear war. This means the architecture for the internet we know today was originally owned and operated (primarily through private contractors) by the US government.

This includes many of the key components of the global network that makes the internet work, such as the domain name system (DNS) that lets you put a name into your browser instead of a string of numbers when you want to access a website.

DOMAIN FEATURE

Back in 1998, with the internet expanding into the world of commerce, the US government transitioned the management of DNS to a new not-for-profit international organisation based in California, and ICANN was born. This organisation and its subsidiaries, such as the Internet Assigned Numbers Authority (IANA), control many aspects of the web, including the allocation of IP blocks to regional authorities who in turn allocate those IP ranges to individual IP Registrars in return for a fee.

This complex system of contracts between ICANN and its authorised registrars, and further contracts between registrars and web hosts, are meant to protect web users against criminal acts. If a host allows (or is informed) that one of its contracted users is operating in furtherance of a criminal act, then the offending domain should be removed.

This means the most effective way of dealing with criminal domains is through civil contract law. However, criminal domains still exist, so this method is clearly not working, and it's all due to the complexity of the contracts and confusion between the parties involved.

For example, for registrars, the 2013 version of the Registrar Accreditation Agreement (RAA) has created new, thorny compliance issues, such as the need to maintain accurate and validated Whois records, which are meant to do away with anonymity for criminal websites.

TAKEDOWN SERVICE

I have many contacts in the website takedown business, most of whom are concerned with intellectual property protection for the branded goods, music and film industries, or with the regulation of pharmaceutical products. Every one of them has a list of non-compliant hosts, and when I've compared those lists side by side, the same host names keep cropping up.

My contacts inform the hosts when domains are involved in the supply of counterfeit products, or host malware or issue spam, supplying enough evidence to ensure the host is in no doubt that the site is in breach of contract and should be removed. Sadly, the response from certain hosts is frequently prevarication; that's if there's a response at all.

ICANN collects fees from registrars, who collect fees from hosts, meaning it's in everyone's interests to maintain these commercial relationships. For organisations or individuals to point out that criminals are operating within this structure causes work to be done by hosts and registrars that may have a detrimental effect on profits.

The system of compliance operated by ICANN is stated as being voluntary. Some people are arguing that there is no such thing as a voluntary contract, and I agree. When the bad guys approach their friendly local registrar and purchase a block of domain names (anonymously) with which to launch yet another series of spam campaigns, does this mean that the money used for the purchase, part of which filters up to ICANN, is actually the proceeds of crime? It does if ICANN knows about it, so maybe we should let it know. ▣

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*External monitor must support HDMI input. [If Continuum-compatible accessory is not included, add: "Accessories sold separately."] **App availability and experience varies by device and market. Office 365 subscription required for some features. ¹Limited to select premium phones at launch. Feature and app availability and experience may vary by market and device.
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Windows 10

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RANTS & RAVES

Should actors be paid less? Should cool stuff cost more? And what exactly do estate agents do for their money anyway? This month's ranters share their financial woes

Mel Croucher
RANTS

Mel gets vocal over actors' demands for a bigger share of the profits from computer games – especially when most of it's just grunting

I BELIEVE IN trade unions using their power to get a fair deal for their workers. And when it comes to making video games, I believe in divvying up any profits among the people who actually do the work. And the profits for a tiny number of video games are huge. And the profits for a huge number of video games are tiny.

I've been hiring voice actors for video game soundtracks since the early 1980s, and believe me when I tell you that voice actors are nothing more than hirelings. I have hired some of the greatest and most famous voices in the business, and we have shown one another respect. But what it boils down to is this: they're given a script, they read it into a microphone, they get paid and they bugger off.

My favourite was Christopher Lee, who performed on four games I produced. No session lasted longer than an hour, and they included pantomime roars, whispered poetry, singing on demand and silliness. I

paid him the standard rate for the job with no question of royalties, and we were mutually delighted with the results. And this from the greatest voice on the planet.

Now hear this. The Screen Actors Guild, based in America, has voted in favour of strike action against the video games industry, unless their actors get substantial royalties on the games they provide voices for. Their warped reason is that voiceover sessions for computerised entertainments are "vocally stressful", and "can last for over two hours".

Well, pardon me while I choke on a mixture of laughter and scorn. Christopher Lee was over 90 last time I worked with him, and he breezed it. A video game takes a creative team at least a hundred thousand working hours to make. And these puffed-up prima donnas are carping about anything more than a two-hour session. Pah! As for the scripts, most of them consist of Neanderthal grunts and

witless drivel that any self-respecting actor should be embarrassed to put their name to, let alone asking for royalties.

If a voice actor thinks contributing to a video game is such hard work, I advise the game producer to thank them politely and get another voice. And if the producer really wants that specific actor, get an impersonator. It's only a voice. A few years ago I wanted to hire Julie Andrews to sing some fascist lyrics in the style of *The Sound of Music*, but Julie Andrews had lost her voice. So I hired an impersonator, who sounded better than Julie Andrews, did the job in half an hour and cost next to nothing, and my adoring public was none the wiser. When voice actors bleat on about just rewards, I suggest they're being grossly overpaid compared with the real workers who create and produce the video games in which they feature. They should think themselves lucky their contribution is so easy to deliver.

Michael Passingham
RANTS

Estate agents will never win the affections of their clients unless they brush up their act. Michael has a few suggestions for starters

WHEN YOU'RE GOING through the painful process of renting a flat, both the landlord and the tenant are landed with huge estate agency fees for seemingly simple office admin tasks. For example, it costs £250 to print and sign a tenancy agreement, which is pretty much an off-the-peg document. Give me a break. And a break clause, while you're about it.

Yes, these fees go towards paying the bills, but estate agents, particularly in London, must be rolling in it. Property prices are increasing at such a rate that the property ladder looks more like a property Eiger North Face with a ladder on top. My point is, if I'm going to pay £250 for your services, those services had better improve the rental process

drastically. Using technology properly is the best place to start.

All estate agents list their properties online these days, which is great. Except when it isn't. Low-resolution pictures, false location descriptions, bad grammar, for heaven's sake (for a case of stones and glass houses, see 'Evil Spell', *Letters*, *Shopper* 325). Technology is supposed to empower us, but it seems estate agencies missed the memo. Here are three simple ways our favourite property brokers could use technology in the viewing process.

Videos: this one is simple. Give me a video tour of the property. Walk round once with a camera in video mode. Stick it on YouTube. Done. I now have an idea of how the property is laid out.

Augmented reality: the Intel RealSense depth-sensing camera is still a work in progress, but the opportunities are huge. This technology can combine images with overlaid measurement information, so you'll never waste a viewing on a property that's not cat-swingingly friendly.

Jargon filter: get rid of all the flowery language and tell us how it really is. "Benefits from" turns to "has". "Spacious" becomes "normal size". "Character features" is now "old stuff that'll make carpeting a nightmare".

Of all my estate agent ideas, this last one will be the hardest to implement. We may need to enlist Google's algorithmic expertise and Amazon's entire cloud computing platform to bring it to fruition.

Chris Finnamore
RANTS

When Chris shells out his hard-earned cash he expects the results to turn heads, but how can he manage that when everything's so cheap?

YOU KNOW WHAT the biggest problem with technology today is? It's just too damn cheap.

There was a time when the latest kit was properly expensive and would stay that way for ages. How jealous was the Ludo-playing 1950s family of their television-owning neighbours? How green were the faces of those bolting their evening meal in time for *Doctor Who*, when next door would calmly record to Betamax and watch at their leisure? How insecure did the Betamax owner feel when witnessing the mind-blowing picture quality and beautiful cover art of their rich friend's LaserDisc collection?

Now everything has changed. Unless you have a Tesla Model X or a Hyperloop in your garden, there's little to brag about.

Technology gets smaller, faster, more capable and, crucially, cheaper at an astonishing rate. What's the point in bragging about your new 4K TV when Skinflint Bob next door can pick one up in Tesco two months later for a fifth of the price? There was a time when those with several grand to spend on a PC could blow their friends away with 3D space operas such as Wing Commander, leaving those less fortunate with their 2D platformers and non-interactive plots. Now any mug can spend the price of a winter jacket on

the latest console and dive into the finest example of the game-maker's art.

In this digital world, there's not even much point paying top dollar in the hope of getting better quality. Very few people will be able to tell the difference between a £2,000 Blu-ray player's output and that of a £50 supermarket special. And don't even get me started on 'premium' HDMI cables.

You might argue that this is a victory for globalisation, competition and mass consumerism, but I say it's sucking all the fun out of showing off. Now please excuse me while I blow my wages on a wrist-worn device that just tells the time and doesn't even have a built-in calculator.

Microsoft rolls out first major Windows 10 update

MICROSOFT HAS STARTED rolling out its first significant update to Windows 10 since it launched in July. The free update is available now for PCs and tablets, and adds several improvements across the board, including better performance, new features in your favourite apps and Windows 10 for Xbox One.

One of the major improvements is a faster boot time. For users who upgrade from a Windows 7 PC, for example, Microsoft promises start-up times that are up to 30% faster, allowing you to get to your apps quicker than ever before. Multitasking has been improved, too, and you can now slide the edge of snapped desktop apps wherever you want, allowing you to resize two apps easily in just one motion. This is already available on tablets, but it's very good news for PC owners.

Likewise, the Windows assistant Cortana now supports digital pens and styli, letting you scribble down notes and reminders directly on your device's touchscreen instead of typing them in. Cortana will recognise your writing, whether it's an address, phone number or email address, and incorporate the information into its Notebook. Cortana can also keep track of your event and film bookings, sending you useful reminders about where you need to go and how long it will take to get there – and US Windows 10 users even have the option to book and track an Uber taxi straight from the event reminder.

Microsoft's Edge browser has received several updates too, including the ability to sync your Favourites and Reading list items across your devices. Tab preview is another new feature, which lets you to hover over your open tabs to see a preview of what's on
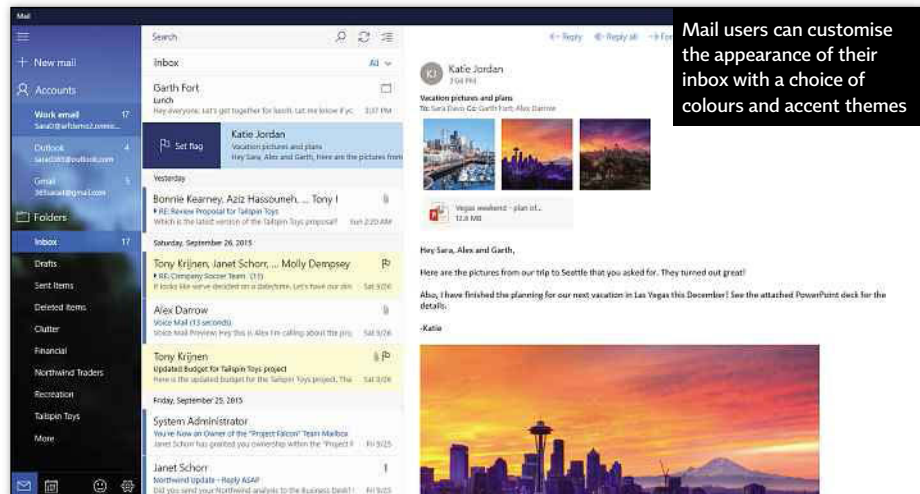
Mail users can customise the appearance of their inbox with a choice of colours and accent themes

each website without leaving the page you're on. In the US, Cortana will also notify users of the best coupon offers from retailers such as Staples, Macy's and Best Buy when shopping through Edge.

Mail and Calendar can now be personalised with light and dark themes, as well as the

ready-to-share albums. You can also make your own photo albums manually and sync any album across every device. The Maps app, meanwhile, presents you with a greater number of alternative routes, and users who have a Windows phone will be able to save the location of their parking spot, too.

One of the major improvements is a faster boot time – up to 30% faster for users who upgrade from a Windows 7 PC

accent colour you use to personalise Windows or your own background photo. The update adds support for new types of calendars, too, including religious calendars, lunar and Zodiac calendars. The Photos app has been redesigned and can now create

In the new Windows 10 update, you can use a stylus to jot down notes in Cortana – a perfect match for the Surface Pro 4

Windows 10 is now also available on Xbox One. The new interface mimics the Xbox app's for a more seamless gaming experience across your devices and multiplayer games should also start faster, too. Cortana is still missing but Microsoft has said it will arrive in 2016.

Microsoft is changing the way it handles upgrades to Windows 10. Previously, users had to opt for the update, but now Windows 7 and Windows 8 users will see it listed as an 'optional update' in Windows Update. This will then change to a 'recommended update' in early 2016. Depending on your Windows Update settings, it may still download to your system automatically, but you'll be asked whether or not you want to continue.

More importantly, Microsoft has simplified the activation process. If you install the latest version of Windows 10, for example, and it doesn't automatically activate, you can enter the original Windows 7, Windows 8 or Windows 8.1 licence key you used on that particular device to activate Windows 10. This also applies if you do a clean install of Windows 10 by booting from a USB stick. If you're not happy with Windows 10 once you've upgraded, you still have 31 days to roll back to your previous version of Windows.
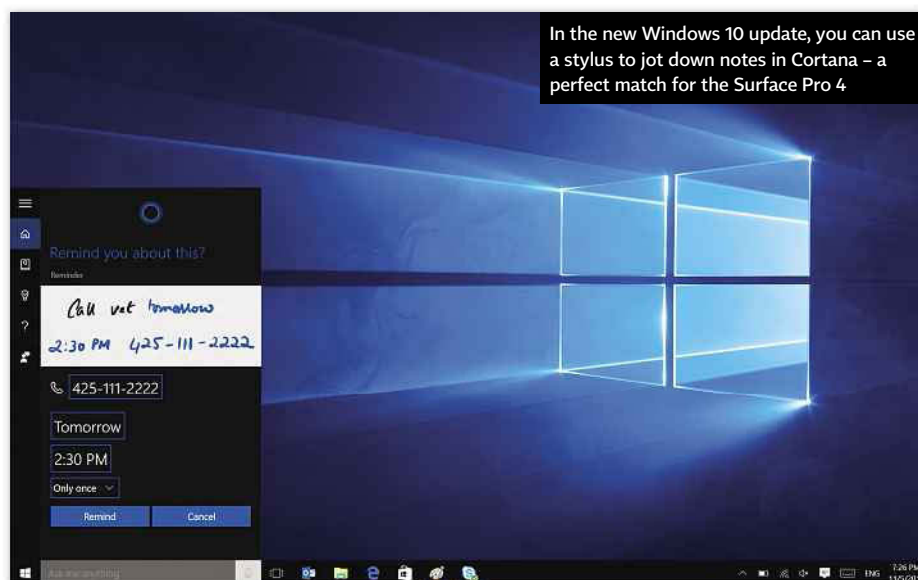
£4 Pi Zero is the smallest, cheapest Raspberry Pi ever

THE £30 RASPBERRY Pi 2 barebones computer isn't exactly expensive, but the Raspberry Pi Foundation has managed to drop the price even further for the new entry-level model. The Pi Zero costs just £4, making it one of the cheapest computers ever.

The smallest Raspberry Pi yet, the Pi Zero is a tiny 65x30mm – that's a fifth of the size of the original Pi. It's also only 5mm thick, so you'll be able to fit one into places too small for the older Pi. The board uses mini connectors to save on space, meaning you'll need to use Mini HDMI-to-HDMI and Micro USB-to-USB adaptors. Online stockists including Element14 and The Pi Hut are selling bundles that include the necessary cables as well as the GPIO header pins, but even if you buy a bundle the Zero is still a third of the price of a Pi 2.

The Pi Zero may be cheaper, but it's not compromised. The new computer is actually 40% more powerful than the original Raspberry Pi, with a 1GHz Broadcom BCM2835 processor and 512MB of RAM. There's a microSD card slot for installing Raspbian or another lightweight Linux distribution, two Micro USB ports for data and power, while the Mini HDMI socket supports 1,920x1,080 resolution displays at 60Hz. The Raspberry Pi Foundation has kept the 40-pin GPIO header, although it doesn't have pins attached.

There have been a few sacrifices in the name of cost and size reduction; the camera and display interfaces have been removed, along with the 4-pole stereo plug and composite video port, but there are still RCA headers on the board if you want to solder connections yourself.

The Pi Zero expands the Raspberry Pi Foundation's aim of providing low-cost computing for everyone. The stripped-down components mainly target users with specific uses in mind, rather than the Pi 2's more general-purpose approach, and the computer is more suited to Internet of Things-style applications and other embedded tasks. Even so, the Foundation expects demand to outstrip supply. The Pi Zero is being built in Wales, with "several tens of thousands" of units produced so far, and the first shipment expected to arrive in UK shops in mid-December. The Pi Zero was also a free covermount on issue 40 of *MagPi* magazine, but that will be sold out by the time you read this.
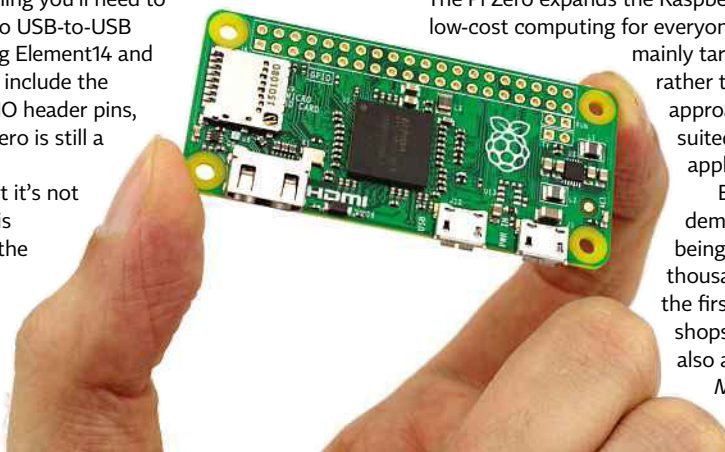
Virgin Media delays public Wi-Fi initiative

WE REPORTED IN *News, Shopper* 333 that Virgin Media was planning to launch a free public Wi-Fi initiative in autumn 2015. The scheme, which would have harnessed customers' Super Hub and Super Hub 2 routers as Wi-Fi hotspots, would allow users to get online without eating into their mobile data while on the move, but a Virgin Media spokesperson has since confirmed to *Computer Shopper* that the company has put its public launch on hold until 2016.

"We're still committed to building a best-in-class public Wi-Fi network," Virgin Media said in a statement to *Computer Shopper*. "Our plans for Virgin Media WiFi are ambitious, including some network innovations and partnerships to bring access to hotspots in places such as pubs, airports and more.

"Creating a good customer experience is often a lengthy and difficult process. In order to deliver the level of customer experience Virgin Media is renowned for, we have decided to extend the beta trial and push back launch into 2016. This has meant that we have reverted to the original firmware to ensure there is minimal impact on customers. We are in trial in Reading with some changes to network (and continue to monitor this closely) to test and improve the service until it meets our quality standards before launch."

The scheme would have enabled hundreds of Super Hubs to create new Virgin Media Wi-Fi areas across the UK, including city centres, airports and the streets near your home. It's a similar idea to BT FON, which currently lets BT customers get online by using a small portion of other BT members' BT Home Hub or wireless router's bandwidth as a BT wireless hotspot. Like BT FON, Virgin Media Wi-Fi plans to use a separate connection to customers' Super Hubs, so you needn't worry about strangers hijacking your network or slowing down your streaming speeds.

However, despite the scheme's extended beta trial, some customers are reporting that their Super Hub 2s are still broadcasting an SSID for public Wi-Fi despite Virgin pulling its firmware update. The only problem is that they can't connect to it. If this is the case with your Super Hub 2, we suggest you restore it to router's factory settings, which should remove the SSID.

THE RESULTS SPEAK FOR THEMSELVES

Qualcomm unveils powerful new Snapdragon 820 processor

QUALCOMM HAS UNVEILED its new flagship system-on-chip, the Snapdragon 820. Company president Derek Aberle announced the new processor in New York in November, and we were there to see it in action.

According to Aberle, the Snapdragon 820 will be far more than just a smartphone chip, as Qualcomm aims to bring the mobile experience to everything from handhelds and Internet of Things to cars and home appliances. To achieve this, the design team's top priorities were low-power computing capabilities, plenty of connectivity options and the ability to scale with each form factor.

The result is an SoC built from entirely new components, making the 820 more powerful, more thermally efficient and longer lasting than any previous Snapdragon chip. It's the first to be manufactured on a 14nm process, with the 64-bit Krio processor providing the grunt while staying cooler than the current flagship SoC, the Snapdragon 810. Support for QuickCharge 3.0 also means you'll be up and running quicker when you do run out of power.

The Adreno 530 GPU has also seen improvements to performance. It should

Qualcomm's new flagship 820 SoC has been redesigned to be more powerful and energy efficient than its predecessor

The Snapdragon 820 will be far more than just a smartphone chip, as Qualcomm aims to bring the mobile experience to everything from handhelds to cars

draw 40% less power than the Adreno 430 in the 810, but provide up to 40% more performance. We were shown an image of a room, rendered to near photo-realism using the GPU and Unreal Engine 4, with physically based rendering correctly showing light and shadow interacting with different materials.

VP of product marketing Tim McDonough went into more detail about the X12 LTE Modem, which will support category 12 LTE and even takes 4G connectivity into currently unlicensed frequency bands. That means Snapdragon 820-equipped devices will be capable of 600Mbit/s downlink and

The next virtual reality headset could be powered by a Snapdragon 820 chip

150Mbit/s uplink speeds over a mobile connection – that's faster than many home Wi-Fi routers. Wi-Fi hotspots will require less power, too, so you'll be able to put those speeds to good use with multiple devices. Other connectivity improvements include multi-user MIMO 802.11ac Wi-Fi, which shares wireless bandwidth from a router or access point between devices more effectively.

Qualcomm is also convinced it's made massive strides with its camera Image Signal Processors (ISP), as the Snapdragon 820 will have better low-light performance than the 810, allowing it to cut down on noise without increasing the time it takes to display the image. A new addition is Heterogeneous Signal Processing, which analyses a scene and balances the light correctly. It's an alternative to HDR that doesn't take multiple images, but correctly exposes both the foreground and the background in a sunset, for example.

Finally, the Hexagon 680 DSP has been developed with virtual reality in mind. It supports recording and playback of directional 3D audio, with speaker virtualisation able to create the impression of multi-channel surround sound in a handheld device.

Qualcomm thinks that all these improvements add up to make a desirable whole, and that you'll be able to justify buying a new phone or tablet once Snapdragon 820-powered devices arrive. With over 60 companies already planning to support the hardware, you may not have long to wait before that becomes a possibility.

Android and Chrome OS could become one by 2017

GOOGLE COULD BE in the process of merging its two operating systems, combining Android with its stagnating Chrome OS to become one unified interface ready to roll out in 2017.

According to *The Wall Street Journal*, sources familiar with the matter believe that Google's plan is a reaction to the growing dominance of mobile computing. It's been said that Google has been working on combining its two operating systems for the past two years and, while it won't allegedly come to market until 2017, we could see our first glimpse of it as early as 2016.

Sources say that Google's Chromebooks will be given a new, as yet undetermined, name, and will have the added benefit of being able to access the Google Play Store's vast app catalogue.

This isn't the end of Chrome, though. As a web browser, Google is keen to keep it running, ensuring its dominance continues across the world. Chrome OS will also stay afloat, but only as an open-source OS for other manufacturers to use on their laptops. Meanwhile, Google's focus is firmly on turning Android into a laptop and desktop OS.

Google is remaining tight-lipped about the issue, as a Google spokesperson confirmed to *The Verge* that Chrome OS is not being 'killed', despite the publication corroborating the initial reports with its own sources. Chrome OS senior vice-president Hiroshi Lockheimer also took to Twitter, saying, "There's a ton of momentum for Chromebooks and we are very committed to Chrome OS".

It's worth remembering that reports of both operating systems merging have persisted for quite some time, and Google really hasn't helped the situation. We've seen Android expand outwards into smartwatches, cars and TVs and even Google's hybrid tablet device, the Pixel C, which runs completely on Android despite its laptop-like intentions. Chromebooks won't be going away any time soon, but it's clear that Google has its computer ambitions firmly focused on Android.

⬆ Google's Chrome OS has been a great fit for Chromebooks, but it lacks the versatility of Android

Get 48% charge in five minutes with Huawei's super-fast battery

HUAWEI HAS LIFTED the lid on two lithium-ion prototype batteries, which can potentially charge a smartphone in just a matter of minutes without negatively affecting battery life.

Qualcomm's Quick Charge 3 technology currently allows handsets to be injected with power in around half an hour, but this can adversely affect the phone's overall battery life and battery capacity. However, Huawei's new batteries allegedly use anodes coated with graphite atoms, which help to preserve the battery while charging.

Sadly, the technology isn't quite ready for public consumption yet, as current prototypes need a bulky charging station to work, and require you to remove the battery from the phone. However, if Huawei develops a slimmer model – or a device with a built-in quick-charge battery – it could end up smashing the limitations on smartphone battery life.

Huawei's test rig requires a bulky charging station to work, but it could potentially revolutionise smartphone battery life

10Mbit/s broadband for all 'by 2020'

BROWSING THE INTERNET can be frustrating for a number of reasons, but one particularly unfair bottleneck is geographical location. If you live in the sticks, the chances are that your internet access will suffer. However, you might only have to wait a few more years before the government steps in to sort the problem once and for all.

The 'universal service obligation' will allow residents the right to request a 10Mbit/s connection, no matter where they live. Given the rate at which websites, apps and services have become more data hungry, it's possible that 10Mbit/s will seem a touch slow when 2020 rolls around, but as ambitions go it's still a positive one: putting fast broadband on the same 'essentials' list as water and electricity.

Unveiling the plans, Prime Minister David Cameron said: "Access to the internet shouldn't be a luxury, it should be a right – absolutely fundamental to life in 21st century Britain. Just as our forebears effectively brought gas, electricity and water to all, we're going to bring fast broadband to every home and business that wants it."

It isn't the first time the government has made promises about our broadband speeds.
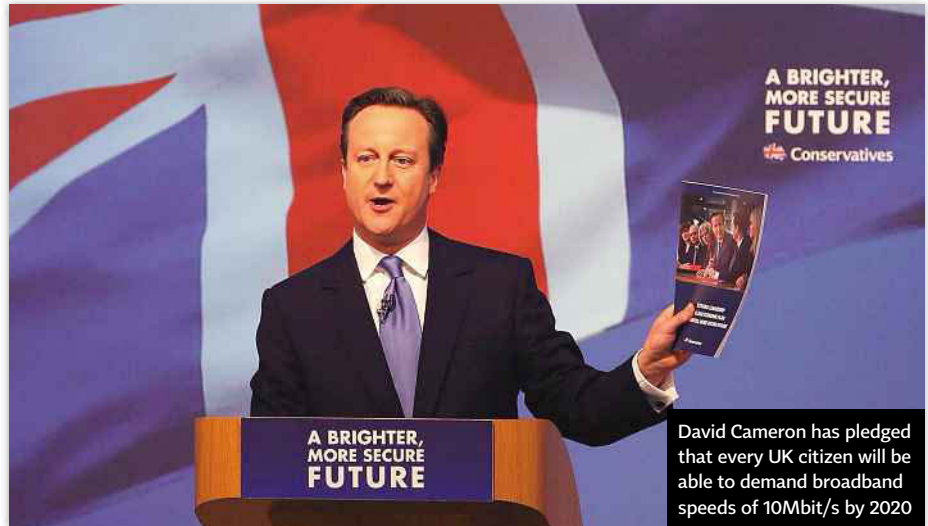
David Cameron has pledged that every UK citizen will be able to demand broadband speeds of 10Mbit/s by 2020

In 2012, then Culture Secretary (now Health Secretary) Jeremy Hunt promised the UK would have the fastest broadband in Europe by 2015, a pledge that hasn't quite played out, according to Akamai data.

The Content Delivery Network (CDN) provides a 'State of the Internet' report several times per year, and in June, it pitched the UK as having the 21st fastest in the world, and the 12th speediest in Europe, behind Ireland, Sweden, Holland, Norway and Belgium, among others. While reported speeds were up from the previous quarter, other countries clearly weren't standing still either.

EE reveals livestreaming 4GEE Capture Cam

FOLLOWING ON FROM its 4GEE Action Cam, EE has announced another 4G-enabled camera that lets you livestream to an audience from wherever you are, provided you have sufficient network coverage.

While the Action Cam was all about high-octane activities, the Capture Cam is aiming for slightly more mundane pastimes and will likely appeal more to businesses, as it's already been used by estate agents for providing streamed house viewings. For regular consumers the Capture Cam could potentially be a useful lifelogging device due to its small size and 4G connection. Weighing 90g and measuring 55mm across, it's a lot smaller than the Action Cam and can be clipped on to your clothing. It also works with GoPro mounts, like the Action Cam.

The Capture Cam has an 8-megapixel sensor for still images and can capture video at up to 720p at 30fps, but the resolution and frame rate might drop depending on network conditions. If your livestream goes down, it will save your footage locally and then pick back up again when network connectivity returns. There's 4GB of internal storage and you can insert a memory card up to 64GB in capacity, too.

The Capture Cam will once again use Skeegle for livestreaming, and you can share a link with friends and family to invite them to view your stream. EE hasn't revealed its various pricing options for the 4GEE Capture Cam yet, but it's expected to launch before Christmas.

◄ The EE 4GEE Capture Cam is smaller than EE's Action Cam, making it easier to clip on to clothing

Hybrid iPad-Mac isn't on the cards, says Cook

APPLE CEO TIM Cook has claimed that Apple isn't interested in developing a hybrid Mac and iPad. Speaking to Independent.ie, Cook claimed that hybrid devices, such as Microsoft's Surface Pro, aren't what consumers actually want.

"We feel strongly that customers are not really looking for a converged Mac and iPad," said Cook. "What that would wind up doing, or what we're worried would happen, is that neither experience would be as good as the customer wants.

"We want to make the best tablet in the world and the best Mac in the world," he continued. "And putting those two together would not achieve either. You begin to compromise in different ways."

Rumours about an Apple hybrid device always spark around the time of a new iPad or MacBook release. With the iPad Pro, many were surprised to see it running iOS instead of OS X, and while its A9X chip is more powerful than some desktop-class CPUs, it isn't intended to be a hybrid device like Microsoft's Surface Pro.

Interestingly, the new 12in MacBook is actually smaller than the iPad Pro but runs OS X, and Cook really sees the difference between Mac and iPad as being user-interface driven. "What we've tried to do is to recognise that people use both iOS and Mac devices. So we've taken certain features and made them more seamless across the devices. So with things like Handoff we just made it really simple to work on one of our products and pick it up and work on the next product."

⬆ Apple CEO Tim Cook says hybrid devices are not what customers want

Microsoft could scrap Windows 10 Android app

WHEN MICROSOFT ANNOUNCED Windows 10 Mobile, it also promised that developers could painlessly port over their iOS and Android apps to its operating system. However, it turns out that Microsoft's Project Astoria, as the software bridge was known, may never come to pass, as it has been inexplicably delayed.

The delay leaves Microsoft in a tough situation. So far, the message around Windows 10 has been largely positive, but with Windows 10 Mobile still unavailable, and having made a public promise of Android APK support, Microsoft risks damaging its newly revamped image.

It's currently unknown why Microsoft has put Astoria on hold, but its demise can be attributed to a handful of reasons, chiefly the project's actual viability. According to Windows Central's sources, the Astoria team was 60-80 employees strong. Compared to the five-employee-strong Project Islandwood team (another software bridge for iOS applications), Astoria just wasn't financially sensible. Also, as Astoria was just simply Android APK emulation, perhaps the legal ramifications of running Android apps on Windows 10 were too high.

Another theory is that trying to emulate the Android subsystem on Windows 10 Mobile led to an unstable experience, something Microsoft doesn't want users to encounter on launch. The latest preview build of Windows 10 Mobile has had all mention of Android stripped out, indicating that this could be a key reason for Microsoft's backtracking.

Microsoft also had quite a hard time convincing developers of Astoria's worth. Unlike Islandwood, where ported iOS apps need only a bit of tweaking to become native Windows 10 apps, Astoria could run Android APKs with no modifications.

While that's handy for speedily launching on Windows 10, any developers looking to take Microsoft's platform seriously wouldn't use it. It would also leave many of Android's vulnerabilities open, requiring a separate regulated store to keep tabs on apps being uploaded – something that doesn't even occur on the current Windows App Store.

So, while Astoria isn't officially cancelled, those hoping to run Android apps on their Windows 10 smartphone shouldn't expect the functionality any time soon.

The Microsoft HoloLens is the only augmented reality headset currently in development, but the Asus AR headset will hopefully be much cheaper
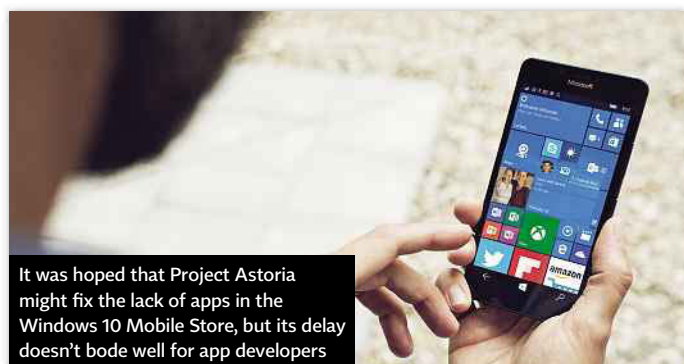
It was hoped that Project Astoria might fix the lack of apps in the Windows 10 Mobile Store, but its delay doesn't bode well for app developers

Asus will be making an AR headset next year

ASUS HAS ANNOUNCED that it's working on an augmented reality headset that is due to arrive next year. Details on the device are currently very thin on the ground, but a report from CNET says that Asus CEO Jerry Shen confirmed the existence of the device in an earnings call last month.

"We think AR [augmented reality] will be very important for people's lives," said Shen. "You can make a real setting meld together with yourself and the AR portion. Internally, we are talking about how to prepare. It should be next year when we come out with a product."

Unlike virtual reality, augmented reality doesn't immerse you in a fully rendered environment. Instead, it can be used to overlay digital aspects on your immediate surroundings, such as a digital screen on your wall for watching a film while someone else watches TV.

At the moment, the only other augmented reality headset on the horizon is the Microsoft HoloLens, but this has a number of hurdles to overcome before it's ready for the public. In its current state, the headset is very bulky, and Microsoft's $3,000 developer kit, which is due to be available in the first quarter of 2016, indicates that it will be extremely expensive as well.

Hopefully, Asus will be able to create a headset that's slightly more affordable than the HoloLens, but right now it's too early to make any concrete predictions.

> "AR will be very important... You can make a real setting meld together with yourself and the AR portion"

Could this box change TV forever?

The new Sky Q box is an incredibly powerful PVR that could revolutionise the way we watch TV. We take a look at what's on offer

THE WAY WE watch and consume TV has always evolved, from broadcast to VCR to today's hard disk-based PVR. However, Sky's new Sky Q box looks set to be a pretty big leap forward not only in how we watch TV in our living rooms, but around – and outside – the home, too.

At the heart of the new system sits the Sky Q box. This replaces the current Sky+ HD box with a more powerful PVR that's roughly half the size, and the top-end Silver version has an incredible 12 tuners inside. That works out as four tuners for recording, one dedicated to the live channel, one dedicated to picture-in-picture, two dedicated to Q Mini boxes, two dedicated to Q Apps and two spares. That means that no matter what you're doing or recording, you can always choose a fresh live channel to watch. It should mean an end to recording clashes forever.

READY AND CABLE

The Q requires only two cables to be run from the satellite dish, and the box can handle decoding the channels. With the old Sky box, each tuner required a dedicated cable. The new system is a huge improvement but it requires the Low-Noise Block downconverter (LNB) on the dish to be upgraded. The new LNB is not compatible with Sky+ boxes or Freesat, so once you've been upgraded by Sky's engineer there's no going back.

There's a bigger 2TB hard disk, providing 1.7TB of space to the user. That's enough for around 350 hours of HD programmes, but it can also download on-demand shows at full broadcast quality (other catch-up services use a reduced-quality streaming version for catch-up), and connect to the Sky Store for film rentals and purchases.

⬇ The box is slim despite all the tech packed inside

There's an HDMI 1.4 output (HDCP 1.2), which Sky says will be upgraded after launch to support Ultra HD. Quite how this upgrade works or what it does is yet to be announced, but we'd expect HDMI 2.0 and HDPCP 2.2 for Ultra HD. Intriguingly, there's an HDMI input too, which could let you plug in another device such as a games console, making it easier to switch between the two. However, it's how the Sky Q box interacts with everything else in your home that really makes it stand out.

First, you can buy the Sky Q Mini box, which lets you get the same living room experience in other parts of the house. It connects wirelessly to your Sky Q over 802.11ac Wi-Fi, Ethernet or its integrated Powerline networking and plugs into a TV via HDMI. The Mini box lets you watch live TV, on-demand and recordings, all independently and without interrupting your main box. That's a huge change in how Sky works, as even people with Multiroom can't watch recordings on one box elsewhere in the house.

Next, the Sky Q app lets you do all the same stuff as a Mini, but from your tablet or smartphone. Everything is seamlessly synced between devices, so you can start watching a programme on one device, then continue where you left off on another. There's nothing else in the UK that can do this for pay TV. Sky could even release apps for other devices, such as games consoles or Windows 10, so you can watch content in even more ways.

THERE'S THE HUB

There's also a Sky Q hub, which replaces your router if you're a Sky broadband subscriber. This gives you 802.11ac Wi-Fi and Powerline networking all-in-one; it also turns Mini boxes into Wi-Fi repeaters, giving you better wireless coverage throughout your home.

Sky has even redesigned its remote, as the Sky Q Touch Remote adds a touchpad for quicker navigation and dedicated buttons for search, a new sidebar feature, series-link record and to jump to your recordings. It uses

⬅ Sky Q seamlessly syncs everything between devices, so you can start watching a show on your TV and continue on your tablet, for example

⬆ You can stream your shows, or download them, to watch on the go

Bluetooth, so you can hide your Sky Q or Sky Q Mini boxes out of sight and it will still work. There's an integrated microphone for voice search, but Sky told us the feature won't be enabled until after launch.

We won't have to wait long for Sky Q either, as Sky has said it will launch in early 2016. The one thing we don't know yet is just how much the service will cost. However, what we've seen so far looks extremely impressive and we can't wait to try it out for ourselves in the coming months. ⬛

The last hurrah of broadcast TV?

Sky may have *Game of Thrones*, but more and more must-watch TV is streamed online. Netflix brought us *Breaking Bad*, *House of Cards* and *Daredevil*, while Amazon's Instant Video service snapped up the *Top Gear* trio.

We're all watching more TV online, with iPlayer alone serving over 250 million programmes a month and showing growth of around 9% year on year. Broadcast TV by comparison has been losing viewers. In recent years audiences have been down by around 6% per annum. This has stabilised somewhat but the most valuable consumers (who advertisers want to reach) are still showing big drops.

Without getting into the split between paid-for and free-to-air channels (accepting that you still need to pay the licence fee to watch these), is broadcast TV doomed? And could the Sky Q box be last broadcast set-top box from the company?

Even if it does turn out that way, Sky looks to doing a great job of moving its customer base from satellite- to internet-based TV. Its new system provides your programming wherever you go and is even designed to give you a great internet connection around your home. It's easy to see Sky simply moving the hub box entirely into the cloud. Then it could launch whole series at the click of a button, in the way Netflix does, and mix that with livestreams of events such as sports and news. The interface would stay the same, the content mix would be unchanged, but the delivery would be a little different, and arguably more convenient.

However, all that presumes that Sky could hold on to its 'crown jewels' of content in a new internet-based age – namely major studio films, HBO and, of course, Premier League football. The NFL, for example, streams American football around the world without the usual tangle of regional restrictions; you simply go online and pay up front to watch every regular season game.

Simply put, content is king. Broadcast has its advantages if you want to send the same thing to lots of people at the same time. But audiences, used to having everything on demand, are voting with their wallets and moving online.

REVIEWS

YOUR TRUSTED GUIDE TO WHAT'S NEW

MICROSOFT Surface Pro 4

COMPUTER SHOPPER RECOMMENDED ★★★★☆

£1,079 inc VAT with Type Cover • From www.microsoftstore.com

VERDICT
Powerful and versatile, this is the ultimate Windows 10 device

MICROSOFT HAS ALWAYS insisted its Surface tablets 'can replace your laptop', but the Surface Pro 4 goes much further. Even for the most proactive multitasker, it can replace your laptop, your desktop and your notepad to boot, becoming the only device you need.

By itself, the Surface Pro 4 is a light, if slightly thick, tablet with a 12.3in screen. Despite having the same footprint as last year's Surface Pro 3, thinner bezels mean the screen is 0.3in larger diagonally. The resolution has also increased to 2,736x1,824, up from 2,160x1,440 on the Surface Pro 3. This takes pixel density from 216ppi to a huge 267ppi, narrowly beating the 12.9in iPad Pro's 264ppi. It's sharp. Really sharp. Lines drawn with the Surface Pen are so smooth you can hardly tell they're on a screen at all. Text looks great, too, with no jagged edges in sight.

BRIGHT AND BEAUTIFUL
The numbers add up, too. According to our colour calibrator, the screen displays 97.5% of the sRGB colour gamut. At maximum brightness, the Surface Pro 4 pumps out 400cd/m², which is far too bright for indoor use. Thankfully, automatic brightness is effective but subtle, always seeming perfectly adjusted. Just 0.3cd/m² of light filters through on pure blacks, even on maximum brightness, resulting in a credible overall contrast ratio of 1,316:1. Colour accuracy is similarly impressive, with an average delta-E figure of just 1.61. This is great for designers and photographers who demand colour accuracy, as they won't need an expensive monitor.

Thinner tablets are often compromised by heavy backlight bleeding around the edges. This isn't the case with the Surface Pro 4; there's a mere 0.04cd/m² disparity between the edge and centre of the screen.

The Surface Pro 4 weighs 786g, which is heavy for a tablet but forgivable when you consider its specification. The kickstand is superb; strong enough to hold the Surface up but easy to adjust with one hand. There are no notches, either: simply tilt it to whatever angle you want and leave it there. The Surface Pro 4 does look chunky, even at only 9mm thick, but this is to accommodate the fans, full-size USB3 port and Mini DisplayPort video output on the right edge. There's also a 3.5mm headset jack on the left. The Surface Pen, which is included in the price, magnetically clips to the edge of the tablet.

The button on the top of the Pen is dedicated to opening OneNote. A double tap opens OneNote to whatever you were looking at last. It all happens in an instant, which is crucial for making the tablet's transformation into a notepad as seamless as possible. It's annoying that Microsoft doesn't let you customise what the eraser button does, though. The AAA battery inside the pen should provide 'all-year' battery life, but there's no way to check power reserves.

With 1,024 degrees of pressure sensitivity, the Surface Pen should be an attractive proposition for digital artists. Most of our usage was in the form of notes, but it did feel incredibly responsive and accurate. Pick a thin pen nib in OneNote but press hard, and the resulting line is satisfyingly thick. The palm rejection is as good as it gets – at no point could we trick the Surface into thinking a finger was the pen.

REVERTING TO TYPE
As a tablet the Surface Pro 4 is superb, but the £110 Type Cover is a necessity for typing. It replaces the full-size keys on last year's model with an island-style layout that looks classier and feels better. Button response is great; there's lots of travel (for such a thin keyboard) and the click response is satisfying.

The Fn key toggle is a really nice touch. Instead of having to hold down the Fn key to access the top row of function buttons, you just hit the Fn button once. Like Caps Lock, the Fn key lights up to let you know it's active.

The touchpad is one of the finest examples we've seen; as it's Precision Touchpad-branded, it supports gestures built directly into Windows, including the three-finger swipe gesture for opening the multitasking

Performance is admirable, with an overall score of 44 in our benchmarks, including a high 78 in the photo-conversion test

pop-up. It also means every tap, swipe and drag feels immediate. We were rarely tempted to use the touchscreen when in laptop mode.

The keyboard and tablet sit comfortably on a desk or your lap, even when sitting cross-legged with the whole lot balanced on one leg. The flexible kickstand also means you don't have to compromise viewing angles.

The front-facing speakers are great. Even at maximum volume, you lose no fidelity from music and dialogue, and there's even a hint of mid-range in there. Covering the tiny grilles at the front makes little difference to sound quality, with most of the audio coming from the tablet portion. You could happily use this device without headphones if you wanted to.

REACH FOR THE SKYLAKE

The mid-range Surface Pro 4 on test here is powered by a dual-core, 2.4GHz Intel Core i5-6300U processor from the Skylake generation. It has a low maximum TDP of 15W, even when Turbo Boosting to 3GHz. Web browsing, emails and videos are all smooth and showed no signs of stuttering at any point, even with media-heavy web pages.

In our intense multimedia benchmarks, the fans unsurprisingly piped up, but the rear of the tablet never became uncomfortably hot, which is a credit to the design of the cooling system. Performance is admirable, with an overall score of 44 in our benchmarks, including a high 78 in the photo-conversion test. For context, a fourth-generation Intel Core i5 desktop chip scores 100 overall. This is a quick piece of kit for short bursts of activity,

but it suffers when performing long, high-intensity tasks such as video editing.

In our Dirt Showdown gaming benchmark, it managed 22.9fps running on High settings at 1,280x720 resolution. This isn't really playable, but cranking it down to Low at the same resolution helped the integrated Intel HD Graphics 520 produce a reasonable 40fps. This isn't a device for hardcore gaming, but the simple 3D games found in the Windows Store and some older titles will be just fine.

Battery life in everyday use is excellent, at a little over seven hours. This was reflected in our battery benchmark, where the Surface Pro lasted 7h 40m. With conservative use and Battery Saver switched on, you might be able to get through a full day of work, but it's best not to leave home without the charger.

It's not perfectly stable, though. Twice when waking the device up from sleep, the screen didn't fire up, despite Windows being logged in and producing sound. We fixed this by connecting a monitor via the Mini DisplayPort connector. The touchscreen also became non-responsive in the middle of a meeting. The touchpad and keyboard

continued to work, but we had to hard-reset the tablet to fix the problem. Microsoft will likely issue firmware updates as time goes on, as it did for previous Surface devices, but right now the Surface Pro 4 isn't infallible.

BENEATH THE SURFACE

There's no doubt the Surface Pro 4 can replace your laptop. It's fantastically well built, has one of the best styluses out there and can power its way through pretty much anything you throw at it.

At the moment, it's the best device to show off the capabilities of Windows 10. It's a cohesive machine where you feel truly connected, thanks to a great touchpad, tactile keyboard and clever stylus. The Surface Pro 4 is the ultimate Windows 10 experience.

Michael Passingham

SPECIFICATIONS

PROCESSOR Dual-core 2.4GHz Intel Core i5-6300U ● **RAM** 8GB ● **DIMENSIONS** 292x201x8mm ● **WEIGHT** 1.37kg inc keyboard and power brick ● **SCREEN SIZE** 12.3in ● **SCREEN RESOLUTION** 2,736x1,824 ● **GRAPHICS ADAPTOR** Intel HD Graphics 520 ● **TOTAL STORAGE** 256GB SSD ● **OPERATING SYSTEM** Windows 10 Pro 64-bit ● **WARRANTY** One year RTB ● **DETAILS** www.microsoftstore.com ● **PART CODE** Surface Pro 4

Windows overall	44
Multitasking	26
Dirt Showdown	22.9fps
Battery life	7h 40m

| 0% | -50 | Reference | +50 | +100 |
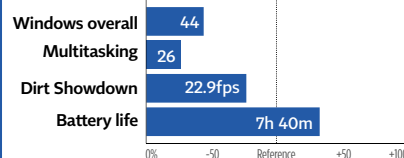
See page 61 for performance details
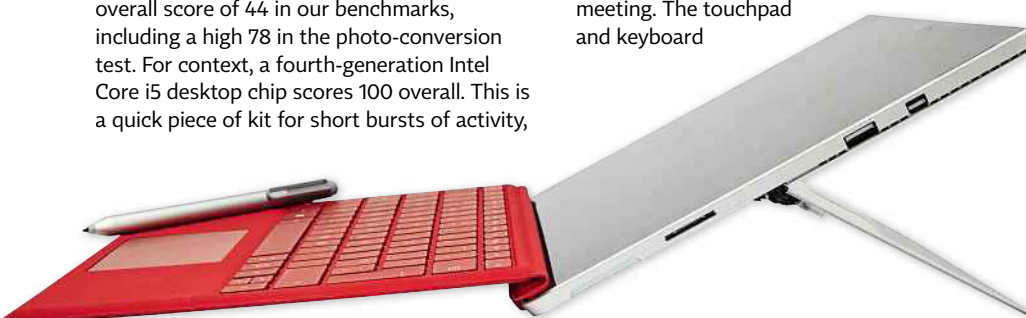
APPLE 27in iMac with 5K Retina Display (2015)

COMPUTER SHOPPER ★★★★★
BEST BUY
£1,599 inc VAT • From www.apple.com/uk

VERDICT

The amazing 5K display makes the iMac a winner, but it's also surprisingly good value

IN THE YEAR since it went on sale, the iMac with 5K Retina Display hasn't seen any real competition. Dell's 5K monitor is the only other display to match its resolution, but that costs £2,000 alone. Apple could have been forgiven for sitting on its laurels, then, but it hasn't, and the 2015 edition is a considerable improvement, not to mention better value.

The 5,120x2,880-pixel screen looks as amazing today as it did last year. As well as making everything pin sharp, it has enough pixels that you can comfortably use two or more applications side by side, or even edit 4K video at native resolution and still have room for your software's controls. Text and icons are enlarged by OS X El Capitan's excellent scaling, so you benefit from a sharper screen without having to squint at the interface.

The 2015 27-inch iMac has a wider colour gamut than last year's model, as it uses the DCI P3 colour space. This means it can display 25% more colours than an sRGB monitor. When you shoot photos or video in a camera's Raw mode, it captures more detail than a typical screen can display. This results in clipping, where subtle changes in colour are blended into a solid block of colour that your display can show. With DCI P3, the iMac can display more of the original colours.

Only new photos or videos that you import (or convert) with a DCI P3-compatible application, such as Adobe Lightroom CC, show any additional detail – existing media will probably have been cut down for sRGB. As such, it's professionals or enthusiasts who will most appreciate the wider colour space.

Comparing DCI P3 sample photos with their sRGB counterparts, the improvements are easy to see. This could be a real boon for photographers, as it preserves more of the colour that was originally captured.

SCREEN WIPE

When we tested the screen with our colour calibrator, we found that it was capable of 99.9% of the sRGB and DCI P3 colour gamuts. With a contrast ratio of 1,166:1 and brightness of 466cm/m², this is a high-quality panel. The only minor issue is brightness consistency, with the corners as much as 10% dimmer than the centre of the screen.

Sadly, the presence of a single timing controller, and the bandwidth required to drive such a high resolution, means the iMac can't be used in 'target mode' as a display for another computer or laptop. Dell's 5K monitor has two timing controllers and requires two Thunderbolt ports to drive it. Thunderbolt 3 has enough bandwidth, so we may see future 27-inch iMacs reinstate target mode in future.

CHIP SWAP

The 2015 iMac makes the switch to Intel's latest Skylake processors. The model we tested has a quad-core, 3.2GHz Intel Core i5-6500 CPU and 8GB of RAM. It scored 100 overall in our 4K benchmarks, making it roughly 10% faster than last year's model, but anyone who has last year's iMac would be unlikely to spot the difference.

The 2GB AMD R9 M390 graphics chip is reserved for the mid-range iMac, while the entry-level model has a slightly slower R9 M380. Both are based on mobile GPUs and aren't massively powerful, so you won't be able to play games at the native resolution. They drive the 5K display smoothly, though, and can handle professional applications.

The entry-level model ships with a 1TB 7,200rpm hard disk, but OS X really needs flash storage for the best performance. As a minimum, you should upgrade to the 1TB Fusion drive, which combines 24GB of flash storage with a hard disk. Frequently used files and apps are stored in flash, while the hard disk provides plenty of capacity. It works well, too – OS X boots quickly and feels as responsive as a PC equipped with an SSD. Read performance in our tests was quick at 687MB/s, although write speeds of 170MB/s were slower. Upgrading to a flash-only model costs £80 for 256GB, £320 for 512GB or £720 for 1TB, but for most users the Fusion Drive represents the best value.

One thing that hasn't changed is build quality. The 27-inch iMac remains one of the best-made and most attractive all-in-one computers around, with a full metal body and stand that give it the distinctive Apple look. The screen still lacks height adjustment though: you can only tilt it.

Due to the thin screen, the ports are all at the back. It's a little inconvenient if you spend a lot of time plugging in memory cards and USB devices, but the iMac swivels easily, so you can access the ports quickly when you need them. There are four USB3 and two Thunderbolt 2 ports, Gigabit Ethernet, an SDXC card slot and a headphone output.

The bundled wireless mouse and keyboard finally use rechargeable batteries, while the former also uses the more tactile key switches found in the latest MacBook laptop. The keyboard takes up less room on a desk but has bigger keys with less travel. The Magic Trackpad 2 is £109 extra, which sounds a lot, but OS X is best used with a Trackpad. The addition of Force Touch makes multitouch gestures and switching apps a lot easier.

If you were to buy a 27in 5K monitor from Dell, you'd have to spend over £2,000, and that doesn't even include a computer. Given the quality of the display, the speed of the internals, the build quality and the amazing wireless peripherals, there's nothing out there that can touch the iMac: it's the ultimate all-in-one for professionals and those who want the best. It wins a Best Buy award.

David Ludlow

SPECIFICATIONS

PROCESSOR 3.2GHz quad-core Intel Core i5-6500 ● **RAM** 8GB ● **FRONT USB PORTS** 0 ● **REAR USB PORTS** 4x USB3 ● **TOTAL STORAGE** 1TB Fusion Drive ● **GRAPHICS CARD** AMD Radeon R9 M390 ● **DISPLAY** Apple 27in integrated ● **OPERATING SYSTEM** Apple OS X 10.11 El Capitan ● **WARRANTY** One year RTB ● **DETAILS** www.apple.com/uk ● **PART CODE** 27-inch iMac

Windows overall	100	
Multitasking	111	
Dirt Showdown		120fps

0%   -50   Reference   +50   +100

ECLIPSE
SuperNova i5n960OC

★★★☆☆

£1,000 inc VAT • From www.eclipsecomputers.com

VERDICT
Garish and a little bit unrefined, the Eclipse i5n960OC is at least a capable gaming machine

ECLIPSE'S SUPERNOVA I5N960OC isn't what you'd call subtle. Its white glossy Aerocool Battle Hawk case is a striking design that harks back to the days when gaming PCs made a statement. The top of the PC is surprisingly busy, with two fan speed switches on the left side of the panel that control the front and top case fans independently. You'll also find a single USB3 port here. On the right there are two more USB2 ports and two 3.5mm audio jacks. You'll also find a handy SD and microSD card reader, which is built into the case without the need to use a drive bay.

The spec matches the styling. Inside, there's an overclocked quad-core Intel Core i5-6600K, which has received a boost from its factory standard 3.9GHz with Turbo Boost all the way up to 4.3GHz. A quiet Zalman CPU cooler keeps the processor operating at peak performance, helping it achieve a decent overall score of 134 in our benchmarks.

MEMORY BANK
We were happy to see that Eclipse has fitted 16GB of DDR4 RAM, which is often something system builders neglect in order to keep the cost down. This will make your PC pretty future proof when it comes to new games and resource-heavy multimedia applications.

Eclipse hasn't scrimped on storage either. You get a 240GB Kingston HyperX SSD for your most-used games and programs, and while the HyperX isn't the fastest SSD out

there, it will still provide a much-needed speed boost over a regular hard disk. For large file storage, the Supernova i5n960OC also has a 1TB Seagate hard disk.

With decent components elsewhere, Eclipse has opted for a mid-range graphics card in the form of 2GB Nvidia GeForce GTX 960. It's one of the best-value cards out there for Full HD gaming, and we weren't disappointed with its benchmark results. Dirt Showdown, a good benchmark for older 3D titles, produced an average of 73fps at Full HD and Ultra settings.

Firing up Metro: Last Light Redux at maximum graphics settings with the GPU-busting supersample anti-aliasing switched on, it produced just 29fps. With SSAA turned off, performance improved dramatically to 50.5fps.

The build isn't the most impressive we've seen: cable management is a little sloppy and some of the unused cables are visible through the case's tinted plastic panel. The hard disk was attached to the chassis by a single screw, so by the time the PC reached us it had been loosened from its mounting point slightly.

ROOM WITH A VIEW
At least there's room for expansion inside the case. You could fit two more 3½in hard disks but you won't find extra space for a 2½in SSD. The Asus Z170-K motherboard has three free SATA3 ports and two free PCI-E x1 slots, as well as a second PCI-E x16 slot for another graphics card, although it runs at only x4 speeds.

The back of the case provides two USB3 ports, two USB2 ports and two USB 3.1 ports, one of which is a reversible Type-C port. As well as five 3.5mm audio jacks, there's an optical S/PDIF connector for high-end audio equipment. The graphics card adds three DisplayPort connectors, an HDMI port and a DVI port.

The supplied monitor – a 26in, Full HD HKC 2615 – is reasonable but not spectacular. We measured colour coverage at just 90.3% and

contrast levels of just 235:1. Viewing angles are extremely narrow, too. It's perfectly adequate as part of the bundle, but if you already have a monitor at home, it might be worth opting out of this monitor and keeping your current screen instead.

The bundle also includes a Thermaltake Commander keyboard and mouse set. The mouse is finished in matt black with blue backlighting and is nicely weighted, with adjustable sensitivity up to 2,400dpi. The keyboard, meanwhile, uses what Thermaltake calls Plunger switches to give the keys a mechanical feel. It certainly gets the noise right, with a loud keyboard press. Of course, if you don't pay for mechanical, you don't get mechanical, and the keys were just a little too hard to press, and lacking the same tactile feel. It's not a bad set overall but, again, if you already have a mechanical keyboard at home, you can skip this one.

The Eclipse SuperNova i5n960OC is good value, with competent processing performance and capable Full HD gaming grunt, along with a keyboard, mouse and monitor for under £1,000. It's a pity the monitor is mediocre and that the build itself is a little garish and unrefined. There are better options, such as the Scan 3XS Performance Z170 GTK6: downgraded to a Nvidia GeForce GTX 960 it costs £933, just £55 more than the Eclipse without a monitor.

Michael Passingham

SPECIFICATIONS

PROCESSOR Quad-core 4.3GHz Intel Core i5-6600K (overclocked) ● **RAM** 16GB ● **FRONT USB PORTS** 2x USB2, 1x USB3 ● **REAR USB PORTS** 2x USB3.1, 1x USB3.1 Type-C, 2x USB2 ● **TOTAL STORAGE** 240GB SSD, 1TB hard disk ● **GRAPHICS CARD** 2GB Nvidia GeForce GTX 960 ● **DISPLAY** 26in HKC 2615 ● **OPERATING SYSTEM** Windows 10 Home 64-bit ● **WARRANTY** Three years RTB ● **DETAILS** www.eclipsecomputers.com ● **PART CODE** SuperNova i5n960OC

Windows overall	134
Multitasking	134
Dirt Showdown	73fps
Metro: Last Light	29fps

0%   -50   Reference   +50   +100

See page 61 for performance details
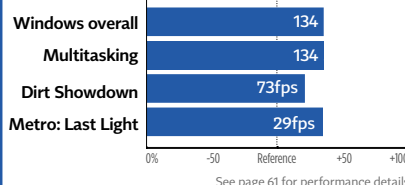
TOSHIBA
Satellite L50D-C-13G

★★☆☆☆

£380 inc VAT • From www.argos.co.uk

VERDICT
The Toshiba L50D-C-13G has an absolutely dire display with processor performance to match

THE SATELLITE L50D-C-13G we received for review was a rather hard-to-ignore shade of purple, but Toshiba supplies it in a range of other colours if you want something less outlandish. That said, at least the bold purple helps distract from the woeful display. The 15.6in glossy TFT panel's 1,366x768 resolution is in line with the L50D's budget price, but its quality is dire.

Incredibly high black levels of 0.66cd/m² left blacks looking closer to grey, while a poor top brightness of 258cd/m² means using the L50D outdoors is a struggle. A contrast ratio of just 393:1 is also terrible and a testament to the poor black levels. Everything looks disappointing and washed out. Usually, a glossy display helps create the illusion of higher contrast, but that's certainly not the case here. Instead, all it did was cause unwanted reflections, making the viewing experience even more frustrating.

Colour accuracy was another area of concern. In our tests the screen reproduced just 61.9% of the sRGB colour gamut, so this is certainly not a laptop for colour-sensitive work. Reds were closer to orange and incredibly washed out. Viewing angles are another area of disappointment, both on horizontal and vertical planes.

The chassis is standard fare for a budget laptop, with a plastic construction. It's quite heavy at 2.2kg and hardly svelte at 23.5mm thick. Keyboards are often an area of concern, as they can flex and bend while typing, but there wasn't any give in this case. The edge of the frame below the keyboard is rather sharp and rough, however.

The keyboard itself is spacious, with a full-size number pad on the right. Keystrokes have very little travel, which can be a bit jarring. Not all the punctuation keys are full size, and the cursor keys have been crammed in with them. Once you get used to the limited travel, though, it's actually not a bad keyboard to type on, and we managed to build up to a reasonable typing speed.

The off-centre touchpad below the keyboard is a slightly different shade to the chassis. Fingers glide easily across the slightly rough surface and it's responsive, even when using multitouch gestures. Ideally it could have been a little

larger considering the size of the chassis, but it's still perfectly usable.

The L50D is powered by AMD's Carrizo-based A10-8700P APU, which combines a quad-core processor running at 1.8GHz with Radeon R6 graphics. The laptop also has a respectable 8GB of memory and a 1TB hard disk. It still comes with Windows 8.1 installed, but as usual a free upgrade to Windows 10 is available.

Performance in our benchmarks was rather lacklustre. The L50D scored just 21 overall in our desktop performance benchmark, with its multitasking score of 7 in particular pulling the average down. Its scores of 41 and 30 in image and video editing were at least reasonable for a laptop at this price.

The integrated graphics were actually very respectable and on a par with a dedicated Nvidia GeForce 920M GPU. We managed 27.7fps in Dirt Showdown at 1,280x720 resolution, which didn't look bad considering the display's low resolution. Modern titles remain out of reach, but you can play more basic titles at lower graphics settings. Minecraft ran without a hitch.

The standout achievement is the L50D's battery life. It managed a very impressive 5h 41m in our light-use battery test. That's just shy of what you could consider all-day battery life, but nevertheless it's very good for this price.

For connections, the laptop has two USB3 ports and a single USB2 port. The HDMI port can output a resolution of up to 3,840x2,160. Network connectivity comes from Ethernet or 802.11n Wi-Fi, and Bluetooth 4.0 is also included. An optical drive and an SD card reader are built in.

The speakers are tuned by Skullcandy and actually don't sound too bad, if a little thin.

The Satellite L50D-C-13G is very much a budget laptop, but even at this price the display is poor. Its performance isn't much better, making it hard to recommend. We'd rather save up an extra £160 and buy the far superior Acer Aspire V3-574G instead (see Group Test, *Shopper* 334).

Richard Easton

SPECIFICATIONS

PROCESSOR Quad-core 1.8GHz AMD A10-8700P ● **RAM** 8GB ● **DIMENSIONS** 380x260x24mm ● **WEIGHT** 2.2kg ● **SCREEN SIZE** 15.6in ● **SCREEN RESOLUTION** 1,366x768 ● **GRAPHICS ADAPTOR** Radeon R6 ● **TOTAL STORAGE** 1TB hard disk ● **OPERATING SYSTEM** Windows 8.1 64-bit (free upgrade to Windows 10) ● **PARTS AND LABOUR WARRANTY** One year RTB ● **DETAILS** www.toshiba.co.uk ● **PART NUMBER** PSKXJE-004005EN

Windows overall	21
Multitasking	7
Dirt Showdown	27.7fps
Battery life	5h 41m

0%   -50   Reference   +50   +100

See page 61 for performance details

MSI GE72 6QF Apache Pro

COMPUTER SHOPPER RECOMMENDED ★★★★☆

£1,257 inc VAT • From www.saveonlaptops.co.uk

VERDICT

The Apache Pro is an eminently powerful, if rather expensive, gaming laptop

MSI'S GAMING LAPTOPS are all built into the same hulking black chassis, and the GE72 6QF Apache Pro is no different. The brushed-aluminium finish looks familiar, as do the crimped lid and red splashes. It's an aggressive look typical of gaming laptops and goes some way to matching the imposing size. Weighing a significant 2.7kg and at 27mm thick, the GE72 isn't designed for portable use, but it's actually 2kg lighter than the Asus G751JT.

The 17.3in screen is the reason for the large footprint. Its 1,920x1,080 resolution is the minimum we'd expect from a screen this size, and the anti-glare coating reduces distracting reflections. Black levels are deep at 0.37cd/m², and a peak brightness of 330cd/m² is high enough for outdoor use at a pinch. Contrast was lower than we'd have liked, with a ratio of 808:1, but images and video had enough punch. At 86% of the sRGB gamut, colour accuracy is fine for gaming but below what you'd want for professional work.

The built-in speakers are surprisingly impactful, with real presence and volume. A headset is still the best option for gaming, but the GE72 is fine for casual listening.

SKY'S THE LIMIT

MSI has made the switch to Intel's Skylake chips for the GE72, opting for a quad-core i7-6700HQ that runs at 2.6GHz and can boost to 3.6GHz. It's paired with 16GB of 2,133MHz DDR4 memory, and delivers a respectable performance jump over the Haswell processor in last year's GE62. Scores were impressive across the board, with 116 overall versus 105 from the Haswell laptop, but Skylake excels at multitasking and video encoding in particular.

The GE72 uses an Nvidia GeForce GTX 970M with 3GB of GDDR5 memory for its all-important gaming performance. It performed as well as other 970M-equipped systems, scoring 84.5fps in Dirt Showdown at 1,920x1,080 and Ultra graphics, and 30.5fps in Metro Last Light at 1,920x1,080 with SSAA enabled. Turning this off made the frame rate leap to 55fps.

In our battery benchmark, the GE72 lasted 2h 40m which is about average for a gaming laptop under light use. Battery life will be a fraction of that when gaming, though, so you'll definitely want to plug the laptop in for anything other than web browsing.

A 128GB SSD and 1TB hard disk are included as standard, and although other configurations offer up to four PCI-E SSDs, they become eye-wateringly expensive. The SSD boot drive could have been bigger: with Windows 10, our benchmarks and a few games installed, we were very short of space.

MACRO MANAGEMENT

Gaming peripheral maker SteelSeries supplies the backlit keyboard. The keys have just enough travel and feedback to aid accuracy, and they're well spaced, so you won't mishit keys as you frantically mash at the keyboard during an intense gunfight. It offers the macro customisations you'd expect of a gaming keyboard – available through preinstalled software – but there are no dedicated macro keys. We've seen these on gaming laptops from Gigabyte, and with plenty of room on the G72's chassis, a vertical row of macro keys would easily have fit in. Without them macros are fiddly to use. The customisation software extends to customising the colours and brightness levels of the backlit keys.

The touchpad is reasonably sized and set off-centre to the keyboard, but it's unlikely to get much use in games, where a USB mouse makes more sense. Even in day-to-day use it was a little frustrating, with occasionally unresponsive multi-finger gestures and a rough finish.

The usual ports are provided, including two USB3 ports and a single USB2 port. A new inclusion is a USB 3.1 Type-C port, which brings the GE72 up to date and will be useful if you have newer devices that use the connection. There's also Gigabit Ethernet, 802.11ac Wi-Fi and Bluetooth 4.1. You can connect a separate display through HDMI or Mini DisplayPort, and audio is handled through a microphone and headphone jack that doubles as an optical S/PDIF for up to 7.1 audio. A convenient SD card reader is included and there's even room for an optical DVD-RW drive, too.

There's a lot to like about the GE72 6QF Apache Pro. It's powerful, which is no surprise considering its high specification, and has plenty of connections, as well as some useful extras for gamers. The only real negatives are its design, which is beginning to feel a little basic, and the miserly SSD storage. Compared with some of its rivals, such as the Gigabyte P37W and Asus G751JT, it's otherwise better specified and good value. It will be interesting to see what MSI's competitors can do with their new Skylake laptops but for now, the GE72 is an impressive yardstick.

Richard Easton

SPECIFICATIONS

PROCESSOR Quad-core 2.6GHz Intel Core i7-6700H
RAM 16GB
SIZE 383x260x27mm
WEIGHT 2.7kg
SCREEN SIZE 17.3in
SCREEN RESOLUTION 1,920x1,080
GRAPHICS ADAPTOR Nvidia GeForce GTX 970M
TOTAL STORAGE 128GB SSD, 1TB hard disk
OPERATING SYSTEM Windows 10 Home 64-bit
PARTS AND LABOUR WARRANTY Two year collect and return
DETAILS uk.msi.com
PART NUMBER GE72 6QF-014UK

383mm
260mm
17.3in
2.7kg
27mm closed

Windows overall	116
Multitasking	119
Dirt Showdown 1080p	84.5fps
Metro	30.5fps
Battery life	2h 40m

0% -50 Reference +50 +100

See page 61 for performance details

BUDGET 8in TABLET

LENOVO Yoga Tab 3

COMPUTER SHOPPER RECOMMENDED ★★★★☆ **£150 inc VAT** • From www.currys.co.uk

VERDICT

It's not a powerhouse, but the Yoga Tab 3 is ideal for kicking back with Netflix

THE YOGA TAB 3'S large cylindrical base gives you something to grip when holding it in one hand, makes room for a larger-capacity battery and hides the unique hinged stand that props the screen up for hands-free use. There's even a hole from which you can hang the tablet, making it ideal for reading recipes in the kitchen.

Lenovo has improved the latest Yoga Tab by integrating the camera into the base. It's mounted on a 180° rotating hinge, so it can be pointed in either direction. Admittedly the angle isn't flattering when the tablet is in Stand mode, but the 8-megapixel sensor is an improvement over typical front-facing tablet cameras.

Picture sharpness and level of detail are both impressive for a budget tablet, with outdoor images showing all the textures you would expect from brick, tile and concrete surfaces. It somehow managed to blow out the sky on a very cloudy day, though. HDR shots take well over three seconds to capture, making camera shake a real issue, and images look wildly oversaturated. Indoors, all our low-light test shots looked grainy and lacked fine detail. It will do in a pinch, but the Yoga Tab 3 won't replace your smartphone camera.

PANEL SHOW

Photos and videos look bright and colourful on the 8in display, although objective tests reveal that Lenovo has used a fairly average quality panel. With 78.2% sRGB colour gamut coverage and a 700:1 contrast ratio, colours aren't as accurate as they are on more expensive tablets such as the iPad Mini or as vibrant as the AMOLED panel on Samsung's Galaxy Tab S2. They're only slightly behind Tesco's excellent Hudl 2, however, and are better than EE's more expensive Eagle tablet.

A maximum brightness of 368.2cd/m^2 is fairly average for an 8in tablet, and is high enough to use comfortably indoors or outside. While viewing angles are good, the glossy screen finish could make light reflections an issue. Black levels are also high at 0.53cd/m^2, leaving dark images looking slightly greyer than we would like.

You don't have to get close to the screen to spot individual pixels, with the 1,280x800 resolution only equating to a pixel density of 189ppi, making small text look blocky and difficult to read.

The quad-core 1.3GHz Qualcomm Snapdragon 212 isn't exactly a powerful chip, especially when paired with just 1GB of RAM. It manages

to open apps fairly quickly, but there's the slightest hint of lag with every tap. With mediocre scores of 315 and 1105 in the Geekbench 3 single- and multithreaded benchmarks respectively, the Yoga Tab 3 is slower than virtually every 8in tablet we've reviewed this year, so is definitely more suited to single light-use tasks.

The Adreno 304 GPU is moderately capable, playing 3D games smoothly and playing back HD video clips without any issue, but scores of 244.1 (4fps) and 113.5 (2fps) in the GFXBench 3 Manhattan onscreen and offscreen tests are disappointingly low. The Tab didn't meet the minimum specifications for Blizzard's Hearthstone, and while you can ignore the warning and play regardless, animations can stutter and the game takes quite a while to load.

HARD CELL

The Yoga Tab 3 does excel in some areas, however. The chunky cylindrical base has room for a much bigger battery than you'd typically find in an 8in tablet. The 6,200mAh cell will easily last all day on a full charge, as it managed a superb 14h 49m in our video rundown test. That's on par with several tablets that cost twice the price, including the Samsung Galaxy Tab S2 and Dell Venue 8. Unlike other Android tablets, it doesn't drain very quickly in standby mode, either, meaning it will still have charge if you leave it in a drawer for a few days.

The bulge at the bottom notwithstanding, the rest of the tablet is only 7mm thick, and at 420g it's light enough to hold comfortably in one hand. There's admittedly not a lot of room around the edges for ports, with just a 3.5mm audio jack and a Micro USB port. Lenovo has managed to fit a microSD card reader underneath the kickstand. This is compatible with 128GB cards, which is useful considering the 16GB base model has only 11GB of user-accessible storage.

With a functional design, high-quality speakers and a decent (though not class-leading) screen, the Yoga Tab 3 is a great budget tablet. It might not have the sleek looks of the Asus ZenPad S, but its unique appearance makes it much more flexible, coming in handy when you want to watch videos or play games hands-free. Anyone after performance would be better served by Nvidia's Shield Tablet, but for video and web browsing the Yoga Tab 3 is an ideal multipurpose tablet.

Tom Morgan

SPECIFICATIONS

PROCESSOR Quad-core 1.3GHz Qualcomm Snapdragon 212 ● **SCREEN SIZE** 8in ● **SCREEN RESOLUTION** 1,280x800 ● **REAR CAMERA** 8-megapixel rotatable camera ● **STORAGE (FREE)** 16GB (11.1GB) ● **WIRELESS DATA** None ● **DIMENSIONS** 146x7x210mm ● **WEIGHT** 420g ● **OPERATING SYSTEM** Android 5.1 ● **WARRANTY** One year RTB ● **DETAILS** www.lenovo.com ● **PART CODE** 146592

Battery life		14h 49m		
	0%	-50 Reference	+50	+100

See page 61 for performance details

GOOGLE Nexus 5X

COMPUTER SHOPPER BEST BUY ★★★★★

£339 inc VAT • From store.google.com

VERDICT

Far greater than the sum of its parts, the Nexus 5X is an excellent Android handset for a reasonable price

THE NEXUS 5X is Google's best chance of making a brilliant, well-sized smartphone that will appeal to most people, but you can't help but feel disappointed lifting it out of the box. Made of plastic, it looks like a budget handset, with utterly featureless side buttons that are so simple as to appear an afterthought. That's not to say that it's ugly; just a bit uninspired.

It's great to hold, though. The plastic finish provides lots of grip and, at 136g, it's among the lightest phones around. The shape is also good, with the rear panel neatly meeting the front bezels. As they did on the Nexus 6, the front-facing speakers provide superior, clearer audio than any tiny port tucked away at the bottom of so-called flagship smartphones.

Underneath the uninspiring exterior lies a powerful smartphone packed with new features, including a rear fingerprint sensor. The circular sensor is placed just below the rear camera, forcing you to adjust your grip; Sony's side-mounted sensor on the Xperia Z5 is still the best implementation around. Resting your finger on the sensor switches on and unlocks the phone almost instantly. It's

Cortex A53 cores running at 1.44GHz. A Geekbench multicore score of 3,489 puts it alongside the similarly specified LG G4 and Moto X Style. It's not the best out there, but in practice everything is quick and smooth. It's well ahead of the Moto X Play's Snapdragon 615 chip, which is sluggish in comparison. In terms of gaming, it's well behind the Xperia Z5 and Galaxy S6, but it played our usual selection of Android titles without a hitch.

Amidst all this is a decent Full HD LCD screen. Even at 5.2in across it has a whopping 424 pixels per inch and, although higher resolutions are available, there's no serious advantage in day-to-day use. In objective tests, the screen stood up well, covering 94.8% of the sRGB colour gamut with 415cd/m^2 max brightness, a contrast level of 1,309:1 and a black level of 0.32cd/m^2.

In most areas, the Nexus 5X is simply competent, but its camera is truly excellent

accurate, too, learning fingerprints quicker than the Samsung Galaxy S6 and recognising them more consistently as well.

The USB Type-C port is a little chunkier and feels sturdier than Micro USB, and the reversible design will be a revelation to Android owners. However, USB Type-C cables aren't exactly common, and Google only includes a Type-C to Type-C cable in the box. There's no video output, despite being supported by the standard, and data transfer rates are only at USB 2.0 speeds. Wireless charging has been dropped, too, but Type-C allows for fast charging, reaching 50% from flat in just 30 minutes.

A 2,700mAh battery is par for the course, given this is a pretty slim 7.9mm handset. In our continuous video playback test, it lasted for a respectable 10h 14m. The Moto X Play lasted for over 13 hours in the same test, but that phone is over 10mm at its thickest point.

The Qualcomm Snapdragon 808 chipset means the Nexus 5X is no slouch. It consists of two high-performance Cortex A57 cores running at 1.8GHz, and four power-efficient

We've seen brighter LCDs at this price, but the Nexus 5X nails consistency. It also has a pleasingly flat colour output, with none of the boosted and garish shades seen elsewhere.

In most areas, the Nexus 5X may be simply competent, but its camera is truly excellent, coming out on top against the very capable Galaxy S6. Twelve megapixels on a typically sized $^1/_{2.3}$in sensor sounds unremarkable, but each pixel is bigger than most, measuring 1.55um. By comparison, the Galaxy S6 reportedly has 1.12um pixels on its 16-megapixel sensor – almost 30% smaller.

Across a range of tests, the Nexus 5X's photos were packed with detail, compared to the more smoothed-off appearance of the Galaxy S6's efforts. Outdoors, you can see great detail in brick walls and a sharper image overall. Colour balance is spot on too, with the camera matching the output of the Galaxy S6 almost exactly.

The Nexus 5X dealt well with high-contrast scenes, eliminating noise from large flat areas of colour without removing detail elsewhere. Colours remained accurate indoors with our

still-life shots, with great detail in complex textures and well-balanced exposures across our various lighting setups.

The Nexus 5X is quick to shoot in HDR mode and you can jump straight to the camera by double-clicking the power button. Google's simple camera app is fine for basic snapping, but lacks any serious manual controls or fancy, fun features.

The latest Nexus hardware is accompanied by a new version of Android, in this case Android 6.0 (Marshmallow). This has lots of nice tweaks and some important changes to app permissions. It's great to have it on the 5X today, but others will catch up quickly.

The Nexus 5X's immediate competitor is the Moto X Play, which costs £60 less, has better battery life, a microSD slot for extra storage, is water-resistant, better-looking and tougher-feeling too. The Nexus 5X has a better camera, is faster with more graphics power, is slightly smaller and much lighter, and it comes with a fingerprint sensor and USB Type-C.

The Nexus 5X isn't the best-looking phone, or the best designed. It isn't the fastest phone, it doesn't have the best battery life and the screen isn't outstanding, either. However, it's far greater than the sum of its parts, and at the reasonable price of £339 it's a great buy.

Seth Barton

SPECIFICATIONS

PROCESSOR Hexa-core 1.8GHz Qualcomm Snapdragon 808 ● **SCREEN SIZE** 5.2in ● **SCREEN RESOLUTION** 1,920x1,080 ● **REAR CAMERA** 12.3 megapixels ● **STORAGE (FREE)** 16GB (10GB) ● **WIRELESS DATA** 3G, 4G ● **DIMENSIONS** 147x73x7.9mm ● **WEIGHT** 136g ● **OPERATING SYSTEM** Android 6.0 ● **WARRANTY** One year RTB ● **DETAILS** www.google.com/nexus/5x ● **PART CODE** LG H791

Battery life | 10h 14m

0%   -50   Reference   +50   +100

See page 61 for performance details

Best new Christmas gadgets

Stuck for Christmas present ideas, or don't know what to ask for yourself? Then feast your eyes on these nine innovative gift ideas…

Scosche strikeDRIVE EZTIP

www.mobilefun.co.uk
www.bubbleit.com
www.cpc.farnell.com
£19.99

If you've ever lost your patience while trying to plug a charger into your phone or tablet, you'll appreciate the strikeDRIVE EZTIP. With this Reversible Micro USB Connector, it doesn't matter which way up you insert the connector, because either way will see it fit securely into your device, saving you time and hassle, and preventing possible damage. The 12W, 2.4 Amp strikeDRIVE EZTIP connects to your car's power socket using a three-foot coiled cable, so it won't get tangled or get in your way.

Scosche magicMOUNT XL Tablet Headrest Mount

www.mobilefun.co.uk
www.bubbleit.com
www.cpc.farnell.com
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Rather than balancing your phone or tablet on your dashboard, get a Scosche magicMOUNT XL Dash/Window lets you mount your mobile device any surface, so you can use it just as happily at home or at work, as you can in the car. Just slip the supplied MagicPlate behind the battery cover or case of your phone or tablet, and it locks to the stand using high-powered magnets, with no need for a cradle. You can then angle your device as required.

Scosche smartSTRIKE

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August DVB500 Smart TV Box

www.idaffodil.co.uk
£87.45

This stylish set-top box comes with a variety of popular apps pre-installed, including Netflix, BBC iPlayer, Facebook, YouTube and Skype, and you can install more from the Play store. You can also watch live Freeview channels in HD, record your favourite shows to a USB drive or SD card and view videos and play videos, music and photos using the built-in multimedia player. For endless entertainment from your sofa, stick the August DVB500 on your Christmas list.

Yamaha MusicCast Trio

http://uk.yamaha.com/en/dealers
£899.95

Enjoy your favourite songs in every room in your home at the touch of a button using Yamaha's brilliant new MusicCast system. This lets you play music from your PC, NAS drive or mobile device, and from streaming services such as Spotify and internet radio on any MusicCast device, and either listen to the same song or different tracks throughout your home. It's controlled via an easy-to-use Android or iOS app, streams over Wi-Fi and Bluetooth and is compatible with a wide range of audio formats.

Elgato Avea

www.elgato.com/avea
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Scosche magicMOUNT XL Tablet Headrest Mount

www.mobilefun.co.uk
www.bubbleit.com
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It's not just drivers who want to use their tablets in the car, but back-seat passengers, too. Scosche's magicMOUNT XL Tablet Headrest Mount uses powerful magnets to hold your device securely in place, once you've inserted a MagicPlate into its case. The mount comes with both large and small MagicPlates, which means you can use it with any size of tablet or phablet, and lets you attach your device in landscape or portrait mode, and any angle in-between.

August MS515 Bluetooth Stereo Speaker

www.idaffodil.co.uk
£32.45

This portable Bluetooth stereo speaker set is the perfect gift for audiophiles, combining a unique design, a 10W output and an impressive 15 hours of battery life. The two speakers pair with your phone, tablet, smart TV or laptop, and non-Bluetooth devices can be connected through the 3.5in audio-in socket. The superb sound can be boosted further using EQ apps for Android and iOS, and you can adjust the volume and skip through tracks using your phone or tablet.

iStorage datAshur Pro

istorage-uk.com
From £69

To prevent anyone from accessing your private data, keep it stored on an iStorage datAshur Pro. Described as the world's most secure USB flash drive, it protects your files using a 7-15 character PIN code and military-grade AES 256-bit hardware encryption. The device locks automatically when you disconnect it from a USB port, includes a rechargeable battery and is dust- and water-resistant. It's available in capacities of 8GB to 64GB, and requires no software or drivers.

BLACKBERRY Priv

★★★★☆

£560 inc VAT • From www.carphonewarehouse.com

VERDICT

It's expensive and could be faster, but the Priv is a return to form for BlackBerry, elegantly combining a keyboard with a modern phone

THE PRIV IS huge, heavy and packed with so many extra features that BlackBerry literally couldn't fit them all in, hiding its infamous physical keyboard beneath the main display.

Push up from the bottom of the phone and the screen slides upwards, revealing a full QWERTY keyboard that's also a touch-sensitive track pad for scrolling and cursor control. It's an elegant solution to something BlackBerry has been struggling with for years.

However, the switch from BlackBerry OS to Android leaves little else to distinguish the Priv from other flagship phones. That hasn't stopped BlackBerry from adding everything it needs to compete, though. The curved 5.4in AMOLED display, for example, slopes round the sides of the phone to the soft-touch rear, creating a near seamless circular edge, much like Samsung's Galaxy S6 Edge.

The 2,560x1,440-resolution screen makes everything look razor-sharp. Colour accuracy is superb, with the AMOLED panel covering the full 100% of the sRGB colour gamut. It delivers bright, punchy colours that really jump off the screen. With perfect 0.00cd/m² blacks, text really stands out against light backgrounds, and a contrast ratio of 41,987:1 captures every shade of shadow detail in between. Maximum screen brightness only extends to 344.46cd/m², but this is typical of AMOLED displays and is still enough to use outside without any great difficulty.

AHEAD OF THE CURVE

BlackBerry has made good use of the curved screen. Swiping the translucent Productivity tab on the curve presents a quick overview of your unread emails, calendar appointments, tasks, missed calls and favourite contacts. It can be moved to either side of the screen, with varying degrees of thickness and height, making it easy to use.

The screen needs a firm push to slide up and down, but the metal rim round the edge provides a firm starting point. The keyboard itself unsurprisingly feels cramped, and some of the keys feel looser than others. It's larger than previous BlackBerry keyboards, but we struggled to write more than a few sentences between typos. The raised keys are tactile, and the Priv doesn't feel top heavy with the keyboard extended, so BlackBerry owners will feel at home. The backlit keys make it easier to type in the dark.

The main benefit is that the physical keyboard leaves you with a lot more screen space. Assigning long-press shortcuts to each key to open apps, dial a particular contact or send a message from the home screen is also handy.

However, it's actually the onscreen keyboard that makes typing easier, with smart word suggestions appearing over the letter you're likely to type next. The physical keyboard has this to some extent, but you're limited to three suggestions at a time.

Security is BlackBerry's forte, so it seems odd the Priv lacks a fingerprint sensor. The DTEK app is also a little disappointing. It does a few things right, offering to encrypt data, but the permissions overview isn't extensive. Rather than alter individual app permissions, it only stops, uninstalls or alerts when an app tries to access something you think it shouldn't. DTEK should get better when the Priv gets Android 6.0 Marshmallow, which BlackBerry says is coming in 2016.

808 STATE

It might have 3GB of RAM, but the Priv's hexa-core, Snapdragon 808 processor lags behind other 2015 flagships. It's not even as fast as other 808-based smartphones, with a Geekbench 3 single-core score of 1,155 and multicore score of 3,433 falling behind the £400 Moto X Style. The Priv is quick in everyday use, but not as fast as it should be given the price. Thankfully, a Peacekeeper score of 1,390 is more promising, putting it ahead of the Samsung Galaxy S6; web browsing is smooth.

Graphics performance is also underwhelming, with only 936 frames in the GFXBench GL Manhattan test, although this is less important considering the Priv's enterprise credentials. Still, demanding games such as Hearthstone are a tad jerky.

With a 3,410mAh battery, the Priv has plenty of staying power, but 11h 11m in our video test is underwhelming. The Galaxy S6 Edge lasted over four hours longer with a smaller 2,600mAh battery. It's enough to get you through the day, and quick charge support makes topping up easier if you get caught short. You don't have to worry about storage; the Priv has 32GB on board, and supports microSD cards up to 2TB.

The Priv's 18-megapixel camera sensor is paired with a Schneider Kreuznach lens, optical image stabilisation and phase-detect auto-focus. Image quality is excellent, with lots of contrast in outdoor images, and bright, natural colours. Processing can be excessive, but photos look pleasingly neutral, and enabling HDR mode improves things further. The Galaxy S6 Edge performs better indoors, though, with low-light photos looking noticeably grainier and less vivid on the Priv. Darker areas lost a lot of detail, and the dual LED flash struggled to restore natural colours.

The Priv's real problem is its price. At £560 SIM free, or £49 per month on contract, it's more expensive than both the iPhone 6s and the Galaxy S6 Edge. That's not to say the Priv doesn't impress in other areas: the display is excellent, it has a great camera, and combining Android with a physical keyboard will be a huge draw for former BlackBerry users that have been sidelined by a lack of apps on BlackBerry OS. We'd expect better performance for the money, though, and a fingerprint sensor for added convenience.

However, if you're not fussed about the keyboard, the Samsung Galaxy S6 Edge is a much better buy.

Katharine Byrne

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expertreviews RECOMMENDED ★★★★★ 5/5

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MOTOROLA Moto X Play

COMPUTER SHOPPER BEST BUY ★★★★★

£250 inc VAT • From www.carphonewarehouse.co.uk

VERDICT

An excellent mid-range smartphone with a camera and battery life to compete with this year's flagships

THE ORIGINAL MOTO X was a distinctly mid-range handset, but the 2nd generation model arrived as a metal-framed flagship. Motorola seems to have come full circle for the third version, retreating back to the more wallet-friendly Moto X Play.

While not the slimmest of phones, and with rounded edges that can be a little slippery, the Moto X Play is comfortable to hold thanks to a rubberised rear panel. It's removable, meaning you can customise the phone with different coloured inlays or Flip Shell cases. Motorola's Moto Maker service has plenty of styles to choose from, for £10 more than the basic black and white models, and you can also change the colour of the metallic accent around the rear camera lens.

Storage capacity affects the price too. The basic model has 16GB, with around 11GB available to the user, and the 32GB version costs an extra £40. You could opt for the 16GB model and spend the extra on a microSD card, though; the Moto X Play supports up to 128GB capacity cards.

SMOOTH OPERATOR

With an octa-core, 1.7GHz Qualcomm Snapdragon 615 processor and 2GB of RAM, the Moto X Play is no slouch. Android 5.1 runs beautifully, with smooth menu animations and lightning fast load times. Its Geekbench 3 scores of 708 and 2,567 are actually on par with the Snapdragon 808-based LG G4, and easily outpaces Snapdragon 615-based rivals including the Vodafone Smart Ultra 6 and Sony Xperia M4 Aqua. However, a Peacekeeper browser score of 828 is decidedly average; things can get quite jerky when scrolling through media-heavy web pages.

While it may only have scored 361 in GFXBench GL's offscreen Manhattan test, equating to roughly 5.8fps, the Moto X Play ran Blizzard's Hearthstone smoothly. You should be able to play any game on the Google Play Store without any trouble.

Battery life is good, too, with the 3,630mAh battery lasting 13h 8m in our video playback test. At just 30 minutes behind the Samsung Galaxy S6, the Moto X Play has the stamina to match this year's top flagships, despite being a fraction of the price.

This is fantastic considering it powers a 5.5in, 1,920x1,080 resolution display, but you're unlikely to get similar figures if you keep the screen's brightness levels turned up to max. Our colour calibrator measured a huge 613.23cd/m^2 on the highest brightness setting, which at least makes the phone easy to use outside. Black levels often suffer when the screen is this bright, but the Moto X Play averts this with a fairly low 0.36cd/m^2 black level, ensuring text is deep and inky and images aren't bleached out by bright whites.

PS I LOVE YOU

Motorola has opted for an IPS display, rather than AMOLED, but an sRGB colour gamut coverage of 91% is still very respectable for a £250 phone, with evenly balanced colours and a high 1,670:1 contrast ratio that ensured there was plenty of visible detail.

All this makes for an excellent viewfinder for the 21-megapixel rear camera. Colours appear rich and vibrant, and there was plenty of fine detail present in our test shots. Some photos were a touch dark in places, but this was quickly remedied by switching on HDR mode, which illuminated images without making them appear too harsh or unnatural.

Colours maintained their vibrancy indoors, while keeping noise relatively low. Beyond manual focus and exposure control, the dedicated night mode is ideal for shooting in low light. While it can't get rid of noise completely, the remaining visible grain was significantly softer than on competing cameras. The Galaxy S6 still pulls ahead thanks to its fantastic noise reduction, but the Moto X Play gives it a run for its money.

Motorola's clever Moto app makes the phone feel much smarter most Android handsets. A twist of your wrist automatically opens the camera, while Moto Display shows the clock and notification icons when you pick it up without having to turn the screen on.

We're also big fans of Quiet Hours, which automatically puts the phone into silent mode while you're asleep but lets priority contacts through. The Moto app interacts with your calendar too, silencing itself during meetings and sending auto-reply texts saying you're busy to anyone who tries to get hold of you.

It's these small touches that elevate the Moto X Play above the competition and make it a much better buy than other £200-300 phones, such as the Samsung Galaxy A5, Xperia M4 Aqua, EE Harrier and HTC Desire 820. It's more expensive on contract, with prices starting at £19.50 per month, but compared to the £15-per-month Xperia M4 Aqua, for instance, you're getting a lot more phone for your money, including a Full HD screen, a superior camera and more storage. While we've yet to try out the Moto X Style, the Moto X Play is a great-value handset in its own right, and its excellent screen, camera and battery life punch well above its weight. It wins a Best Buy award.

Katharine Byrne

SPECIFICATIONS

PROCESSOR Octa-core 1.7GHz Qualcomm Snapdragon 615 • **SCREEN SIZE** 5.5in • **SCREEN RESOLUTION** 1,920x1,080 • **REAR CAMERA** 5 megapixels • **STORAGE (FREE)** 16GB (11GB) • **WIRELESS DATA** 3G, 4G • **DIMENSIONS** 148x75x8.9mm • **WEIGHT** 169g • **OPERATING SYSTEM** Android 5.1.1 • **WARRANTY** One year RTB • **DETAILS** www.motorola.co.uk • **PART CODE** XT1562

Battery life		
	13h 08m	
0%	-50 Reference +50	+100

See page 61 for performance details

NVIDIA
Shield Tablet K1

COMPUTER SHOPPER BEST BUY ★★★★★

£150 inc VAT • From www.ebuyer.com

VERDICT
Ditching superfluous features makes the Shield K1 one of the best sub-£200 Android tablets

LAST YEAR'S ORIGINAL Shield Tablet was a seriously powerful gaming tablet that packed in a lot of extra value if you happened to own an Nvidia graphics card. Unfortunately, a battery overheating issue forced the company to recall, and eventually withdraw, the device from sale. However, it's now back as the K1, an updated version with a battery that won't blow up unexpectedly.

Battery aside, the differences between the K1 and the original Shield Tablet are mostly skin deep. The K1 has a silver Shield logo on the rear rather than a shiny black one, the edges of the tablet are matt, rather than shiny, and the speaker grilles have a rubberised finish, rather than the plastic seen on the original. The ports, buttons and speakers are all in the same places. You don't get a stylus any more, and there's no docking mechanism to store one inside the tablet. There's no Micro USB power adaptor in the box, either, which helps keep costs down.

There have been a few cost-cutting changes inside, too. The 4G LTE modem and 32GB storage options are gone, with the K1 only available in a 16GB, Wi-Fi-only configuration. There's still a microSD card slot for adding extra capacity, at least.

POTENT PERFORMER
Otherwise, the K1 is almost identical to the original Shield tablet. It has the same Tegra K1 quad-core processor running at 2.2GHz, 2GB of RAM and the incredibly fast Kepler SMX GPU, which made the original such a potent gaming machine.

A Peacekeeper browser benchmark score of 1,148 is on a par with Samsung's £400 Galaxy Tab S2, which helps make web browsing feel very fluid and responsive. Geekbench 3 single- and multicore scores of 1,142 and 3,554 are also among the fastest we've seen from an 8in Android tablet, which helps Android 5.1 Lollipop animate, open apps and multitask smoothly.

At 12h 10m, it's among the longer-lasting 8in tablets, but still falls slightly behind Samsung's Galaxy Tab S2, which managed over 14 hours. Even so, you'll get a full day of use from the K1, and should manage over five hours when playing graphically intensive games.

Graphics scores of 1,801 (or 29fps) in the onscreen and 1,961 (or 32fps) in the offscreen GFXBench GL Manhattan tests are second only to the iPad Air 2. There's

simply no other Android device that's as fast. It shows in games such as Blizzard's Hearthstone, with battle animations looking incredibly smooth.

As a Shield device, the K1 includes Nvidia's GeForce Now and GameStream services. The former provides unlimited access to 50 PC games, which are streamed from the cloud to your tablet, for £7.49 a month. The selection is mostly limited to older titles, with newer games such as The Witcher 3 available separately at a premium, although these justify the extra cost by including a Good Old Games or Steam key for offline play.

GameStream is the free alternative that uses a PC equipped with an Nvidia graphics card to stream your games library locally over a wireless network. It's frustrating that Nvidia hasn't added 802.11ac networking to the K1 for uninterrupted streaming, but this was missing from the original tablet so it's not a surprise to find it absent here too. Even on 802.11n, however, gameplay is smooth and impressively free from compression artefacts.

DISPLAY TIME
Nvidia has kept the same display, opting for a 1,920x1,200 resolution and relatively high 283ppi pixel density panel. An sRGB colour gamut coverage of 79.2% was above average when the Shield first launched, but in a £150 tablet it's a very respectable score indeed. Black levels remain rather high at 0.4cd/m², and a contrast ratio of 823:1 isn't particularly outstanding, but an above average maximum brightness of 434cd/m² gives photos and videos plenty of punch.

The side-firing stereo speakers are still some of the best we've heard from a tablet, producing a clear mid-range and relatively crisp trebles. There's even some semblance of bass presence, and stereo separation is noticeable in films and TV.

We loved the Nvidia Shield when it first arrived, and the price cut only makes us love the K1 more. For £150 there's very little else out there that's as powerful or as flexible when it comes to gaming. Losing the stylus and power adaptor to lower the price significantly doesn't make the K1 any less of a bargain, as we didn't find the stylus very useful and have plenty of USB cables lying around. Many will prefer Google's Nexus 9 for its 4:3 aspect ratio display, but you'll have to spend significantly more to get anything better.

Tom Morgan

SPECIFICATIONS
PROCESSOR Quad-core 2.2GHz Nvidia Tegra K1 •
SCREEN SIZE 8in • **SCREEN RESOLUTION** 1,920x1,200 •
REAR CAMERA 5 megapixels • **STORAGE** 16GB •
WIRELESS DATA No • **DIMENSIONS** 221x9.2x126mm •
WEIGHT 390g • **OPERATING SYSTEM** Android 5.1 Lollipop •
WARRANTY Two years RTB • **DETAILS** www.nvidia.co.uk •
PART CODE Shield Tablet K1

Battery life 12h 10m

| 0% | -50 | Reference | +50 | +100 |

See page 61 for performance details

SONY RX10 II

COMPUTER SHOPPER RECOMMENDED ★★★★☆

£1,181 inc VAT • From www.wexphotographic.com

VERDICT

A formidable camera at an equally imposing price, it's the Sony RX10 II's slow motion modes that really stand out

THE RX10 WAS a triumph of substance over marketing spin. Its headline specs weren't particularly attention-grabbing, but the combination of a generously sized 1in sensor and 24-200mm zoom lens with constant f/2.8 aperture was an inspired choice for high image quality in a wide range of shooting conditions. The handsome magnesium alloy body, elegant controls, fast performance and superb video features all contributed to an impressive camera.

Now we have the RX10 II, and it's great to see that everything we liked about the original model is still intact. It has the same lens and sensor, and the external design and controls are almost exactly as they were. The Delete button is now labelled C2, and can be given an alternative function while shooting. The left and right navigation buttons are also customisable, but with so many unlabelled buttons it can be tricky remembering what is assigned where.

The card slot is side-mounted for easy access when using a tripod, but the position of the door makes it hard to retrieve cards. This is presumably to make room for the adjacent Memory Stick Pro Duo slot, but it's about time Sony retired its proprietary card format.

These are minor points, though. With a lens ring for zoom, another for aperture, an exposure compensation dial, a command dial for shutter speed and a rear wheel for quickly adjusting other settings, this camera is designed for fluid operation. The electronic viewfinder has been upgraded from 800x600 to 1,024x768 pixels, and gives a clear, detailed view of the scene.

The biggest changes are in video. 4K capture is available in XAVC S format, at a choice of 24, 25 or 30fps and 60 or 100Mbit/s. Picture quality is outstanding, with crystal clear details that

easily surpass Full HD output, even on a 1080p screen. We noticed some compression artefacts in fast-moving 60Mbit/s 4K footage, but as this bit rate far exceeds common distribution formats, it's not a big concern.

Video autofocus is smooth and responsive, but professionals will have reservations about controlling autofocus without the option to move the autofocus point via a touchscreen.

1080p video capture is available at seven frame rates from 24 to 120fps, so the fastest can be slowed down in editing software for 5x slow motion. A dedicated HFR (high frame rate) setting offers 1080p capture at a choice of 250, 500 or 1,000fps, delivering 10x, 20x or 40x slow motion, albeit with some caveats.

SECONDS OUT

Recordings are limited to two seconds of capture, equating to between 20 and 80 seconds' playback encoded at 50Mbit/s. There's a long wait while the camera saves the buffered video at the playback rather than record speed. The camera must be ready for capture, locking focus and exposure settings while the camera constantly buffers frames. A couple of times we missed the moment as the camera wasn't ready. At least the RX10 II can save two seconds of video from before the record button was pressed, though.

Capture resolution also varies with the frame rate. For 250fps it's just shy of 1,920x1,080 resolution at 1,824x1,026, but it falls to 1,676x566 at 500fps and 1,136x384 at 1,000fps. The difference is all too evident in the resulting footage so we'd stick to 250fps.

Photo image quality and performance are in line with the original RX10, which means they're excellent. Photos are captured every 0.4 seconds in normal use, and autofocus is reliably quick. A speed-priority burst mode rattled off 45 JPEGs at 13.7fps, while shooting with continuous autofocus was at 5fps.

The 1in sensor is smaller than most CSCs' sensors, but bigger than most bridge cameras'. As a result, noise levels fall between the two. It's the f/2.8 constant-aperture lens that makes the biggest difference, allowing for faster shutter speeds and slower ISO speeds. It captures four times as much light as the average kit lens at the long

end of the zoom, which more than compensates for the smaller sensor. It also helps that the 24-200mm (8.3x) zoom range is bigger than most kit lenses.

The lens, sensor and image processing live up to their promises, and the result is a camera that holds its own in virtually any environment. The only notable limitation is for wildlife and sports photography, where the 200mm maximum focal length may not be enough to capture more distant subjects. The similar Panasonic FZ1000 has a 25-400mm lens, but its f/2.8-4 aperture captures half as much light at the maximum zoom.

TOUCH TOO MUCH

Almost everything about the RX10 II is great, but we have two doubts that stop it earning top marks. One is the lack of a touchscreen, which is a significant drawback for video capture – something this camera is otherwise superbly equipped for. If video isn't a concern, you're better off with the original RX10.

The RX10 II's lens is extremely versatile, but while it can't be replaced, you'd have to spend £1,500 on 12-35mm and 35-100mm lenses for the Panasonic GH4 to match the RX10 II's 24-200mm (equivalent) focal length range and f/2.8 aperture. The RX10 II's lens takes most challenges in its stride, but it won't ever give the sumptuous shallow depth-of-field effects of a wide-aperture prime or the ultra-telephoto focal lengths required for wildlife photography. Still, if you just want one camera for all occasions, this is an excellent choice. If you're a fan of slow motion, the RX10 II might be hard to resist.

Ben Pitt

SPECIFICATIONS

SENSOR RESOLUTION 20 megapixels ● **SENSOR SIZE** 1in (13.2x8.8mm) ● **VIEWFINDER** Electronic (2,359,296 dots) ● **LCD SCREEN** 3in (1,228,800 dots) ● **OPTICAL ZOOM (35mm-EQUIVALENT FOCAL LENGTHS)** 8.3x (24-200mm) ● **35mm-EQUIVALENT APERTURE** f/7.6 ● **WEIGHT** 813g ● **DIMENSIONS** 88x129x102mm ● **WARRANTY** One year RTB ● **DETAILS** www.sony.co.uk

Battery life	400 shots			
	0%	-50 Reference	+50	+100

See page 61 for performance details

CANON EOS 5Ds

★★★★☆

£2,999 inc VAT • From www.jessops.co.uk

VERDICT

A 50-megapixel sensor in a beautifully designed camera, but it risks being a niche product

THREE YEARS AGO, the Canon EOS 5D Mark III scored straight As for image quality, features and performance. A lot has happened since, not least the arrival of the Nikon D750. The two cameras are closely matched for image quality, performance and features, but the D750 has a tilting screen, Wi-Fi and costs just £1,500. Canon has hit back with the EOS 5Ds, which comes with a 50-megapixel sensor – the highest to date for a full-frame SLR.

This equates to 8,688x5,792, which is enough for A1 prints at 250dpi. There can't be many people who feel the need to print at such large sizes, but it's somewhat reassuring to never have to worry that your images aren't detailed enough. It's great for large group portraits – perhaps at weddings – as you can zoom in to people's faces. It allows judicious use of the crop tool while still maintaining plenty of detail. It's also worth noting that a sensor's output is crisper after it's been resized downwards; a 50-megapixel sensor should produce crisper 24-megapixel photos than a 24-megapixel sensor.

SENSOR RESPONSIBILITY

There's no shortage of superb Canon EF lenses to choose from, and we'd expect them to live up to the demands of this sensor. With the same pixel density as a 20-megapixel APS-C sensor, this sensor requires a similar level of lens sharpness as the current generation of 24-megapixel cropped-sensor SLRs.

The 5Ds is fitted with the same 61-point autofocus sensor as the 5D Mark III. It's a dense array of points, and 41 of them are cross-type for increased sensitivity. When shooting with an f/2.8 or brighter lens, the central column of five points are dual-cross-type for extremely accurate focusing.

Metering has been upgraded with a 150,000-pixel sensor that measures red, green, blue and infrared colour channels. It's a big step up from the Mark III's 63-zone metering sensor, and should lead not only to improved metering but also superior subject tracking for autofocus. Subject tracking is

good, but not brilliant; we didn't have both cameras to compare directly but Nikon D750's tracking mode felt more reliable.

Auto ISO mode is more customisable than before. The minimum shutter speed can be set manually, or adjusted dynamically depending on the focal length. Unlike on the 5D Mark III, it's possible to shift these dynamic speeds towards slower or faster values. However, the Auto ISO setting doesn't respond to motion of the subject or camera. For moving subjects it's essential to set the shutter or ISO speed manually.

Files are about twice the size as the 5D Mark III's, with JPEGs varying from 10 to 30MB depending on the complexity of the scene and Raw files weighing in at around 55MB. Higher-resolution sensors (and their processing needs) tend to draw more power, and sure enough, battery life has fallen from 950 to 700 shots.

CONTINUITY ANNOUNCEMENT

Continuous performance also takes a hit, although the move to a faster processor means it's not as drastic as it could have been. While the 5D Mark III shoots at 6fps, the 5Ds manages 5fps. It slowed after 43 JPEGs to 3.1fps when testing with an SDHC card (rated at 94MB/s), but continued for over 100 JPEGs when testing with a CompactFlash card (rated at 90MB/s). Raw continuous shooting lasted for 18 frames before slowing to around 2fps.

We've long admired EOS cameras' JPEG output, with a colour palette that strikes a sublime balance between accuracy and flattery, and the 5Ds is no exception. Automatic exposures are expertly balanced, and we rarely felt the need to reach for the exposure compensation dial.

This camera is all about detail, and most shots had it in abundance. There were times when

camera shake, focusing errors or subject motion took the edge off, but given the number of things that can compromise detail levels, it's reassuring that sensor resolution is unlikely to ever be the weak point.

The downside is that noise levels are higher. At 1:1 pixel magnification, the difference was noticeable at ISO 800 and more significant at ISO 3200 and above. However, comparing output at similar overall sizes, the difference was much subtler. This is a modern full-frame digital SLR and image quality is as high as you'd expect.

Those who have been waiting expectantly for an EOS camera with 4K video recording will have to keep waiting. The 5Ds is a stills camera with few incentives for videographers. That's perfectly reasonable, but Canon could have come up with a little more than a new sensor in the three years since the 5D Mark III. We'd have liked an articulated touchscreen, particularly if it could be used to adjust the autofocus point while using the viewfinder. Wi-Fi and GPS wouldn't have gone amiss, either, even if it had to be a removable hotshoe-mounted unit to get around the shielding of the magnesium alloy body.

Sadly, though, Canon doesn't offer bespoke camera designs to order. The EOS 5Ds is what it is and, for the most part, it's very successful. If the 50-megapixel resolution appeals and you're willing to sacrifice a little performance, battery life and an extra £750, this is clearly the camera for you.

Ben Pitt

SPECIFICATIONS

SENSOR RESOLUTION 50.3 megapixels ● **SENSOR SIZE** 36x24mm (full frame) ● **FOCAL LENGTH MULTIPLIER** 1x ● **VIEWFINDER** Optical TTL ● **LCD SCREEN** 3.2in (1,040,000 dots) ● **LENS MOUNT** Canon EF ● **WEIGHT** 845g ● **DIMENSIONS** 116x152x76mm ● **WARRANTY** One year RTB ● **DETAILS** www.canon.co.uk

Battery life				700 shots	
0%	-50	Reference		+50	+100

See page 61 for performance details

LG 55EF950V

★★★★☆

£2,499 inc VAT •

From www.currys.co.uk

VERDICT

A stunning 4K HDR TV, but an idiosyncratic OS and missing catch-up services are a disappointment

THE 55EF950V IS one of the most technologically advanced TVs to have ever graced our Labs, with a dazzling array of features that cinephiles will love. It has a 4K OLED panel, HDR video compatibility, Ultra HD upscaling and LG's vibrant webOS-based smart TV system.

However, the first thing you'll notice when you get the TV out of its box is its astonishing design. The screen is surrounded by bezels just 1cm thick, with an almost invisible frame keeping everything upright. The stand is made from transparent plastic, and while it would be an exaggeration to say the TV looks as if it's floating, it's certainly stylish. The tiny bezels draw your eyes into the screen, and with such a large TV, the more immersive the better.

The 55EF950V produces some amazing images, too, thanks to its ability to play HDR-enabled video. HDR is produced in a wider colour space, which means colours are more vibrant, yet retain the same inky blacks that OLED panels are capable of. The result is a more realistic and more detailed image, with darker spots on screen in particular reaping the benefits of a huge range of colours.

The level of detail in LG's own HDR demo footage was beyond anything we've seen on a conventional TV. The difference was pronounced when compared to non-HDR 4K footage; yes, the detail was still there, but the lack of colour depth made the non-HDR footage look almost flat by comparison. Of course, stock footage is designed to highlight the strengths of the TV's technology, so the difference is unlikely to be so stark in the real world.
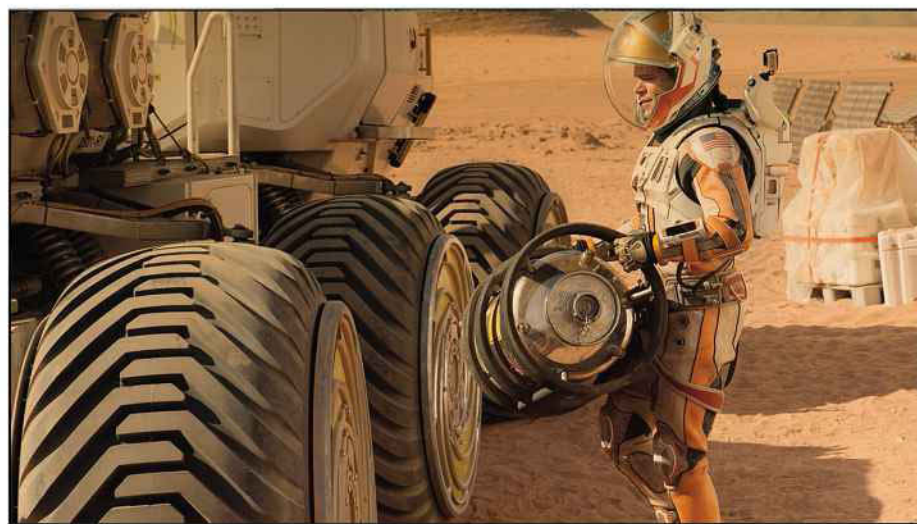
Sadly, LG doesn't ship its TVs with any HDR content, and the only way to access HDR video in the UK is using Amazon Instant Video, where it's available on a couple of Amazon's original shows, including *Mozart in the Jungle*. Netflix's HDR content is still in the works, while 4K Blu-ray discs are expected to arrive in 2016. Amazon and Netflix do at least support 4K video on some titles, as long as your internet connection is up to it.

With 4K content so thin on the ground at the moment, Full HD upscaling performance has to be top-notch in order to justify the high cost. Luckily, LG has absolutely nailed it on the 55EF950V. Even 1080i broadcast TV

The level of detail in LG's HDR demo footage was beyond anything we've seen on a conventional TV

looks good, thanks to well-judged noise reduction and edge sharpening. Faces are surprisingly detailed, with natural-looking skin tones and impressive amounts of detail on freckles and facial blemishes. Even SD content, which is often so eye-punishingly ugly and smudgy on large 4K sets, is acceptable, although you should stick to HD channels where possible.

24fps Blu-ray content looks even better. *Interstellar* could almost be mistaken for 4K thanks to impressive detail upscaling. Out-of-the-box image settings were great, but it's worth taking the time to adjust the extra image options, especially colour saturation, OLED light and white balance. Each setting is adjustable to the most minute detail, and you could easily spend hours tweaking.

The standard frame interpolation settings are well suited to slow-to-medium-speed objects moving both horizontally and vertically; *Interstellar* is very challenging in this regard, but there were few occasions where the spacecraft looked juddery. Even so, some edges looked very artificial; when the spacecraft was flying high above a planet, it appeared to be superimposed. This is partly down to edge enhancement, and also down to the fact that it's an upscaled image.

Equally good is the sound from the build-in speakers. Both music and movies sound superb, even at maximum volume. If you want to hook up other speakers, there's an optical S/PDIF connector at the rear, along with three HDMI ports and three USB ports.

LG's WebOS 2.0 interface is bright, colourful and smooth for the most part. The menus are great to look at; you get one across the bottom with buttons taking you to your apps, app store and live TV, and can move your most-used applications so they always show up where you want them. There's voice control and universal search, too, although we could only get the universal search controls to find content in the EPG, Wuaki.TV and YouTube.

The absence of All 4 and ITV Hub catch-up services is a worry. BBC iPlayer and Demand 5 are both present, as is Sky Now TV, but the lack of such big catch-up players is a shame.

The 55EF950V is a fantastic TV for early adopters; once you've seen the quality of the images it produces it's hard to go back to conventional non-4K, non-HDR content. However, living with a dearth of catch-up services is annoying. It's not a huge issue if you're willing to buy a streaming stick such as a Chromecast or Roku, but when you're paying as much as £2,500 for a TV set, you'd expect it to be the complete package.

Michael Passingham

SPECIFICATIONS

SCREEN SIZE 55in • **NATIVE RESOLUTION** 3,840x2,160 • **VIDEO INPUTS** 3x HDMI, Composite, Component • **TUNER** Freeview HD • **DIMENSIONS** 883x1,450x236mm • **WARRANTY** One year RTB • **DETAILS** www.lg.com/uk • **PART CODE** 55EF950V

CONNECTION PORTS

HDMI x3   Composite   Component
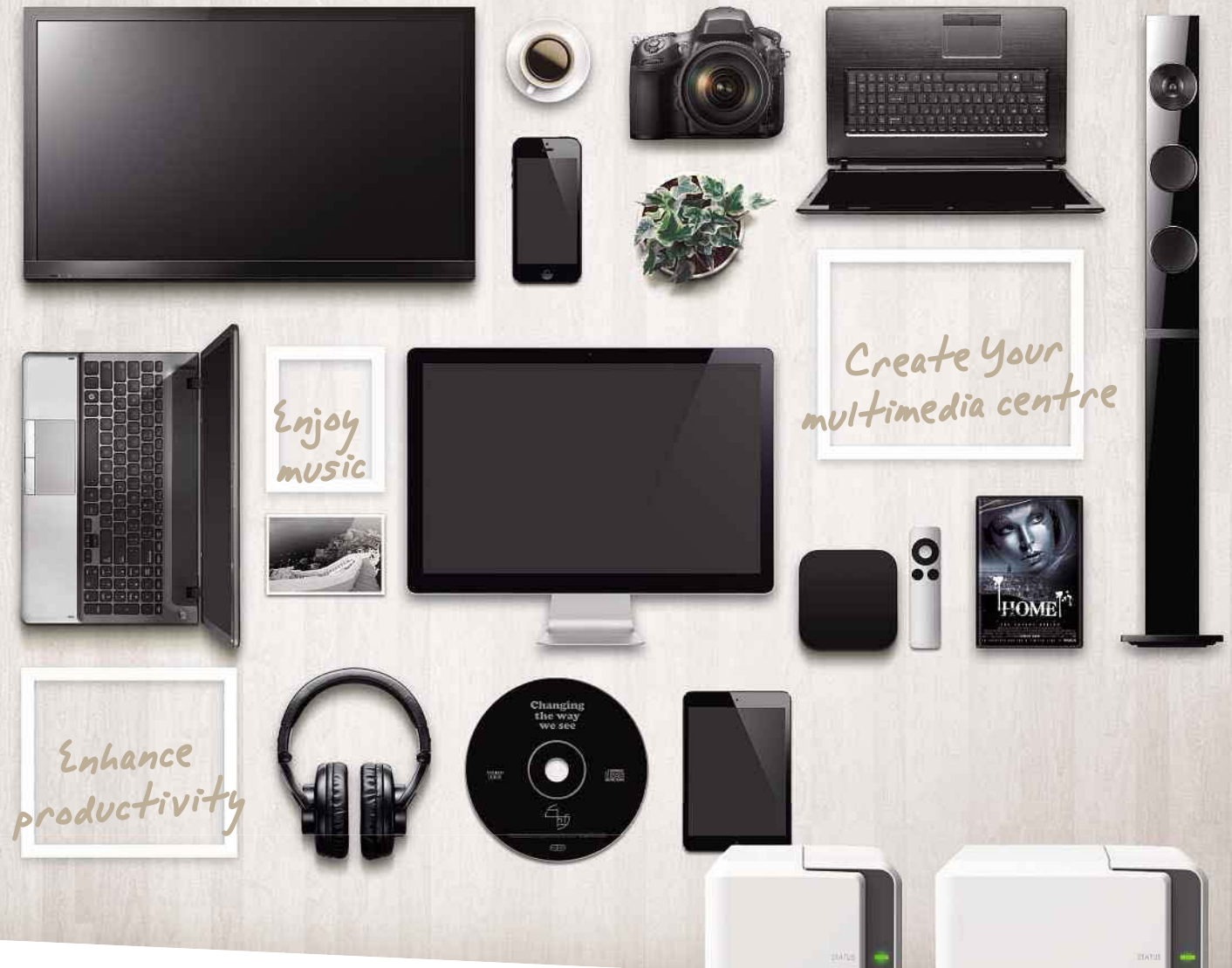
DS115**j** AND DS215**j**
THE PERFECT DATA STORAGE SOLUTION FOR YOUR HOME

Run your own personal cloud from the comfort and security of your home

POWER-SAVING AND RELIABLE

DS215j features a dual-core CPU, supports up to 12TB of data and consumes less than 14w when active while the DS115j offers a stable storage environment for users with no need for raid, consuming less than 11w when active.

ACCESS ANYWHERE, ANYTIME

Synology NAS' and the intuitive DiskStation Manager (DSM) software allow users to sync and share files among multiple devices, including Windows PC, Mac, Linux, iOS, Android and Windows Phone.

MULTIMEDIA CENTRE

Audio Station, Photo Station, Video Station and Media Server transform your Synology NAS into a centralised multimedia hub.

Where to Buy

Synology apps available on

Synology's Media Accolades

SONY HT-XT3

COMPUTER SHOPPER BEST BUY ★★★★★

£289 inc VAT ●

From www.richersounds.com

VERDICT

The Sony HT-XT3 is a great soundbase with integrated subwoofer and plenty of connections

THE HT-XT3 IS a slightly chunky sound base, as it's almost twice as thick as the Philips Fidelio XS1 SoundStage (see *Shopper* 335). This is primarily because Sony has packed in a pair of downward-firing subwoofers, as well as a multitude of connection methods.

Protruding feet give the downward-firing subwoofers some clearance, but also add to the overall height. With a TV on top, it's not the most elegant setup. Up to 50kg or 65in TVs are supported, but you're also restricted by your TV's stand design; larger sets with feet at either end, rather than a central pedestal, might not have enough clearance for the sound base to slide underneath.

Aside from its height, the HT-XT3 is fairly attractive, with a glossy piano-black finish across the top and a seamless speaker grille dominating the front. The grille is detachable, if you want to show off the pair of tweeters, but the exposed holes the grille clips into aren't that attractive. At a reassuring 10.5kg, it doesn't suffer from any discernible rattle, even with the subwoofer turned all the way up.

An LCD display behind the speaker grille has several brightness levels, and it can automatically turn off after a few seconds so it doesn't prove distracting when watching television at night. The touch-sensitive controls along the top match those used in many of Sony's more recent speakers, including its multiroom models.

HDMI ARC and digital optical connections are available on the back of the unit; HDMI ARC is preferable if you have it, letting the HT-XT3 replace your TV's built-in speakers and letting you adjust the volume and power using one remote control. You'll still need the HT-XT3 remote for changing inputs and other settings, but HDMI ARC makes the basic activity of watching television with sound far simpler. Usefully, the HT-XT3 has three HDMI inputs, for adding a set-top box or games console, and HDCP 2.2 for 4K pass-through if

you have an Ultra HD set. There's an auxiliary connection and USB port, too, so you're well covered for both inputs and outputs.

You can also connect via Bluetooth. The HT-XT3 supports Sony's LDAC codec, which can support up to three times the bit rate of Bluetooth SBC. This means it can handle transmission of even high-resolution audio at up to 990Kbit/s. You'll need an LDAC-compatible device as an audio source and, unsurprisingly, Sony's high-resolution Walkman audio players are among them. There's a handy NFC contact point so you can quickly pair a device.

The HT-XT3 is an internet-connected soundbase. You can either use the Ethernet port on the back, or the built-in Wi-Fi. Once connected, the soundbase becomes a Google Cast-compatible speaker, and there's Spotify

Connect if you have a Spotify Premium account. You can also use the soundbase in conjunction with other Sony multiroom speakers, using the SongPal app for iOS and Android. You can play music independently, or simultaneously by grouping together different speakers. Grouping speakers only takes a couple of taps. Like many of Sony's current crop of audio devices, the HT-XT3 is capable of high-resolution audio playback, and you can stream files from a network drive or PC.

A pair of forward-facing woofers and tweeters at opposite ends of the soundbase, placed in a coaxial configuration, deliver the HT-XT3's sound. This means that the mids and trebles radiate from one location, as the coaxial tweeter is located directly in front of the woofer. The sound is crisp, with a wide

soundstage. The subwoofer is independently adjustable to your taste, but you won't want to push it to its maximum as it can begin to slightly distort, unsurprisingly impinging on the other frequencies. About halfway delivered the best results.

Throw on a Gregory Porter track and vocals are delicate, floating nicely above the sound of the double bass. Movies and television, which will arguably be your main sources, have good delivery, too. Dialogue is easy to follow, even without fiddling with the Voice settings. There are three settings: one standard, another with dialogue enhancement and one with dialogue enhancement and adjustments for frequencies that are often

The sound is crisp, with a wide soundstage, and the subwoofer is independently adjustable to your taste

lost for the hard of hearing. There are different preset EQs for Movies, Games, Music, Sport and a Standard setting, as well as something called ClearAudio+.

The latter is available on many of Sony's audio devices and provides an automatically optimised experience. Needless to say, you have plenty of options to find a setting you like. Dialogue in *Interstellar* was crystal clear, even during the more intense action sequences where the soundtrack can often make dialogue indiscernible, and the low rumble of the many spacecraft throughout the film was well represented.

It's not as elegant-looking as the Philips Fidelio XS1, but Sony's HT-XT3 still looks classy and delivers great sound. HDMI pass-through ports, internet connectivity and multiroom capabilities are a real boon. You'll have a good degree of future-proofing with the 4K pass-through support, too.

Richard Easton

SPECIFICATIONS

SPEAKERS 4 ● **RMS POWER OUTPUT** 350W (total) ● **DIMENSIONS** 750x358x83mm ● **WEIGHT** 10.5kg ● **DOCK CONNECTOR** None ● **NETWORKING** Bluetooth (SBC, LDAC) ● **WARRANTY** One year RTB ● **DETAILS** www.sony.co.uk ● **PART CODE** HT-XT3

SONOS Play:5 (2015)

COMPUTER SHOPPER RECOMMENDED ★★★★★

£429 inc VAT • From www.sonos.com

VERDICT
The updated Sonos Play:5 is far sleeker than its predecessor and sounds great

THE SONOS PLAY:5 was beginning to look a little dated, so we're happy to see a refresh. The 2015 model has clean, uninterrupted looks, and is available in matt black or white finishes. Importantly, it can now be stood horizontally or vertically, giving you more flexibility when it comes to placement.

Rotating the Play:5 affects the speaker arrangement and acoustics, but Sonos has turned down the top tweeter when positioned vertically so sound isn't directed towards the ceiling. A gyroscope controls the touch-sensitive controls on the top, so the volume buttons always work as you'd expect.

The three mid-woofers and three tweeters are paired with six class-D amplifiers to deliver room-filling sound. Bass in particular carries an impressive degree of weight and impact, without muddying the high-end. The mids and treble are bright and crisp. Hi-hats were distinct in jazz tracks and vocals have superb clarity. Across genres, the Play:5 performed exceptionally, delivering impact when tracks required it, or a more delicate touch for acoustic, vocal-driven songs.

Enabling Trueplay through the companion app improves things further. The speaker emits test notes and your phone's mic takes measurements as you walk around the room, before calibrating accordingly. It's limited to iOS at present, but with the speaker in an enclosed space such as a bookshelf, Trueplay emphasised the higher frequencies and restored some of the lost detail.

The Sonos Controller app has by far the largest number of music-streaming services, including Spotify, Deezer, Google Play Music, and Tidal, as well as plenty of internet radio services. Apple Music support is coming soon, too. You can also access local music stored on a handheld running the Sonos Controller app, a networked computer or NAS.

Sonos also lets you play multiple streams from one Spotify account. This means you can play different tracks in every room where you have a Sonos speaker.

You can group multiple speakers together, or pair two Play:5s in stereo. If you position the speakers vertically you get a wider soundstage; horizontally gives you more distinct stereo separation. If you have a Sonos Playbar and Sub you can also use two Play:5s for the rear channels in a wireless 5.1 setup, although this will prove quite costly.

The only real letdown about the Play:5 is the lack of Bluetooth; it leaves Sonos slightly on the back foot, an unusual situation for the multiroom pioneer. Regardless, whether you're a Sonos owner looking to add a new speaker, or are buying your first one, the Play:5 is attractive and sounds great.

Richard Easton

SPECIFICATIONS
SPEAKERS 6 • **RMS POWER OUTPUT** Not disclosed • **DOCK CONNECTOR** None • **NETWORKING** 802.11n Wi-Fi • **DIMENSIONS** 364x154x203mm • **WEIGHT** 6.4kg • **STREAMING FORMATS** SonosNet • **WARRANTY** One year RTB • **DETAILS** www.sonos.com • **PART CODE** Play:5

BOWERS & WILKINS Zeppelin Wireless

COMPUTER SHOPPER RECOMMENDED ★★★★☆

£499 inc VAT • From www.bowers-wilkins.co.uk

VERDICT
The Zeppelin Wireless is a streamlined, modern update to an audio classic

THE LATEST VERSION of B&W's high-end Zeppelin speaker has all the connection methods you'll need, from wired and wireless Ethernet to Bluetooth. By removing the Apple dock, the Zeppelin's lines are far cleaner, too.

The shape also complements the driver arrangement. The 6.5in subwoofer in the centre has an ultra-long voice coil, directing lower frequencies forward. This is flanked by two 3.5in mid-range, Fixed Suspension Transducer drivers, which B&W says allow the edge of the speaker cone to terminate without any resonance. Two smaller 1in double dome tweeters on each end deliver the high-end.

You get a play/pause button and volume controls, plus Ethernet and an auxiliary jack for connecting a wired audio source, as well as AirPlay, Bluetooth and Spotify Connect. The latter two are new, opening up compatibility beyond Apple's ecosystem.

You'll need to connect the Zeppelin Wireless to your network using the B&W Connect iOS app, or the Windows or OS X desktop software. Setup is simple, with good guidance throughout. Spotify Connect integration works well. If you're a Spotify Premium subscriber, you can stream music directly through the Spotify app.

A remote control is no longer included, but the Connect app can adjust the volume if you don't want to use the buttons on the speaker. Subtle buttons built into the logo on the front switch between auxiliary and Bluetooth. Pairing over Bluetooth is straightforward, but there's no NFC support to make it even easier. At least the aptX codec is supported.

There's a delicate refinement to the speaker's sound, especially in the mids and trebles. Vocals in particular sound wonderful, floating delicately over the instruments in acoustic tracks. Hip-hop and electronic bass has the kind of impact that hits you in your core, but remains tight and focused without muddying the rest of the music. There's a decent amount of stereo separation, too.

At 6.5kg, the Zeppelin Wireless is reassuringly weighty. The front fascia is considerably thicker than previous versions to cut down on reverberation. Certainly, there were no issues with the cabinet negatively influencing the sound at loud volumes.

The Zeppelin Wireless is expensive, but its sound quality and design go some way to justifying the price. The only thing missing is multiroom audio. Still, if you want a single speaker that delivers pitch-perfect audio, the Zeppelin Wireless is an excellent choice.

Richard Easton

SPECIFICATIONS
SPEAKERS 5 • **RMS POWER OUTPUT** 150W • **DOCK CONNECTOR** None • **NETWORKING** Bluetooth (SBC, aptX), 802.11n, Ethernet • **DIMENSIONS** 660x183x188mm • **WEIGHT** 6.5kg • **STREAMING FORMATS** AirPlay • **WARRANTY** One year RTB • **DETAILS** www.bowers-wilkins.co.uk • **PART CODE** Zeppelin Wireless

APPLE Apple TV (2015)

COMPUTER SHOPPER RECOMMENDED ★★★★☆

£129 inc VAT • From www.apple.com/uk

VERDICT

Slick, powerful and with a brilliant voice-activated remote, Apple TV is a top media streamer, but it needs more apps

THERE'S ALWAYS BEEN one thing missing from Apple TV: an app store for downloading new services and customising the experience. That changes with the 4th generation model.

It has the same 98mm square footprint, but new internal hardware means the new model is 35mm tall, compared to 23mm. The A8 processor found in the iPhone 6 reappears here, providing more power for games and apps than the old device, and there's a choice of 32GB or 64GB of storage.

It's not so much bigger that you'll struggle to put it anywhere and it will sit neatly under a TV without getting in the way. It's brilliantly made, with a reassuringly heavy feel to it that gives the Apple TV a feeling of ruggedness.

Power, HDMI 1.4a, 10/100Mbit/s Ethernet and a USB-C service port are found on the back, but the digital optical audio output is gone. The lack of Ultra HD support will be a problem for some people but, according to Apple, 1080p is the right compromise between quality and the internet bandwidth required to stream video. 802.11ac Wi-Fi is more than fast enough to stream Full HD content, particularly if you have an 802.11ac Wi-Fi router running on the 5GHz band.

The interface will feel familiar to anyone that's used a previous-generation Apple TV, despite running on the new tvOS operating system. Apps are still laid out in a grid, but the home screen looks a little bare. You get the basic range of Apple apps, but the rest is yours to fill from the new app store.

There are few apps at the moment, and some big names are missing. None of the terrestrial catch-up services has a dedicated app, although some support AirPlay streaming from an iOS device, and Sky Now TV has just arrived. The number of apps is growing all the time, and at the time of writing Games was one of the most popular categories, with top iOS titles Lumino City and Crossy Road already making the jump to the big screen.

TAKE CONTROL

This is where the redesigned remote control really shines. With some games, the trackpad moves an on-screen cursor, while others use the built-in accelerometer. It's reminiscent of the Nintendo Wii, and there's even an optional wrist strap to make sure you don't accidentally throw the remote. An integrated battery is charged via the Lightning port and will last months at a time. You can also pair a Bluetooth games controller for more traditional games or two-player action.

The addition of a trackpad, extra buttons and Siri voice control improves the remote further. The trackpad makes zooming around the interface easier, with velocity taken into account: a quick swipe moves through lists faster than a slow one. It also fast-forwards or rewinds through content, but it's easy to brush against it when you pick up the remote, inadvertently skipping through your content.

Using the onscreen keyboard is a chore, but the Siri microphone button lets you use your voice, searching for content using the universal search engine. At the moment, supported apps include iTunes video and Netflix, although Music support is coming and other services may be added later. If you miss a bit of dialogue, you can say, "what did he/she say" and the Apple TV will jump back and switch on subtitles for that chunk of action.

Extra buttons on the remote might sound like things have become more complicated, but they all serve a useful purpose. Volume buttons let you adjust sound without reaching for your TV's remote; the Menu button skips back a step and takes you to the top of lists, such as the top of the Netflix interface; the Home button takes you to the home screen instantly, and a double-tap opens up the task switcher. This latter function is one of the best things about the new Apple TV, letting you switch between apps quickly without having to find their icons on the home screen.

SLICK NOTE

The new Apple TV is a great media streamer. It has a smooth and slick interface, with a remote and voice control that destroys anything even the best TV can offer. Adding an app store makes a huge difference and will ensure that the latest Apple TV evolves quickly. Admittedly, the app store is a little quiet at the moment, but in the short time we've had it more apps have been released.

For some the lack of Ultra HD will be a disappointment. There's also no support for Amazon Instant Video yet, and with Amazon being bullish about its streaming hardware you may not see this on the Apple TV for some time, if ever. If you just want something cheap and are happy to beam stuff from your phone, the Chromecast is hard to beat on value.

David Ludlow
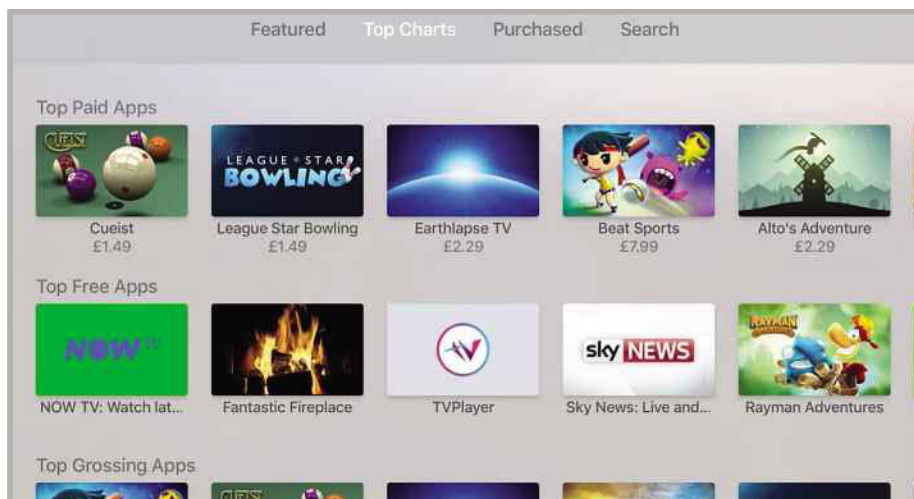
SPECIFICATIONS

VIDEO OUTPUTS HDMI 1.4 ● **NETWORKING** Bluetooth 4.0, 802.11ac Wi-Fi, 10/100Mbit/s Ethernet ● **DIMENSIONS** 98x98x35mm ● **STREAMING FORMATS** AirPlay, others via apps ● **INTERNET STREAMING SERVICES** iTunes, Apple Music, Netflix, Now TV. Via AirPlay: BBC iPlayer, ITV Player, All 4 and BT Sport ● **WARRANTY** One year RTB ● **DETAILS** www.apple.com/uk/tv/specs ● **PART CODE** New Apple TV

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HUMAX FVP-4000T

★★★☆☆

£200 inc VAT • From www.johnlewis.com

VERDICT
A little slow, and Freeview Play isn't as strong as rival catchup television services

UNTIL RECENTLY, YOUR two main choices for catch-up services that worked directly through an EPG (electronic programme guide) were Freetime via Freesat or YouView. That's now changed, with Freeview launching its own catch-up platform called Freeview Play.

Like its rivals, Freeview Play lets you go back in time through the conventional EPG to find content you've missed. It's meant to be a simpler approach than using catch-up apps such as BBC iPlayer, but each individual app is still available. This is crucial for watching Channel 5 content, as Demand 5 isn't yet integrated into Freeview Play.

Humax is the first manufacturer to launch a Freeview Play PVR, the FVP-4000T. It's available with 500GB (£200) or 1TB of storage (£230) and in a choice of either 'coffee inspired' Cappuccino (white) or Mocha (dark brown) colours. It's around the same size as the HDR-1100S Freesat PVR, with a similar design that does away with the redundant SCART connection and front LCD panel.

The FVP-4000T has a faux-leather top complete with stitching, unlike the plain glossy finish of the HDR-1100S. It looks a little kitsch, but it's not something you'll notice if the PVR box is slotted into your AV cabinet.

The main menu, available through the Home button on the remote control, is broken down into five sections: On Demand, TV Guide, My Recordings, Media Centre and Settings. Menus and the EPG are overlaid on the current channel, so aren't too disruptive when searching for new content.

The EPG is straightforward, with a large, easily legible timeline. You can only see five channels at a time, however, and there's no quick way of paging up and down, making scrolling rather slow. Thumbnails for programmes don't always load, either. Quickly being able to jump to an HD-equivalent channel when initially switching to the SD version makes a welcome return from Humax's other PVRs.

Scrolling left in the EPG accesses Freeview Play content, for up to seven days' worth of scheduling. However, this is where Freeview Play's shortcomings become apparent. Only content with a small Play icon can actually be watched on demand. Selecting anything else just brings up the programme details. BBC channels have plenty of almost instantly watchable content, but ITV and Channel 4-related channels are far sparser. Scroll back 24 hours and things improve, but there are still plenty of holes in what's available. If you've just missed a programme, chances are it's not going to be watchable through Freeview Play until later. Freeview Play also comes up short compared to YouView, which supports Channel 5 and a few extra channels beyond the terrestrial providers.

These complaints, beyond the responsiveness issues with the FVP-4000T's

After being massively impressed by Humax's Freesat boxes, it's difficult not to come away disappointed with its fledgling Freeview Play PVR

interface, are more aimed towards Freeview Play, but the platform certainly feels like it needs refinements and improvements.

The traditional On Demand interface has all the usual terrestrial catch-up services, as well as a few extras, but the only really notable one is YouTube. Services such as Netflix are supposedly coming in the near future, which will be a real bonus.

With three tuners, the FVP-4000T can record up to four channels while watching a previously recorded programme. Usefully, if somehow you manage to max out the tuners, the FVP-4000T will let you know if a particular show is being repeated at another time. You can then choose either to record it at a later time or cancel one of your existing recordings.

With the 500GB model, you can expect about 300 hours of SD recording or 125 hours in HD. Handily, the FVP-4000T remembers where you left off when watching your recordings. As well as playing back recordings you've made, there's also the Media Centre section of the interface. Like Humax's other boxes, this lets you access content either on USB flash drives or on a NAS on your network, including images, music and video.

The numerous apps for iOS and Android devices include a remote control, Live TV and a media player app. The remote control app, as you would expect, lets you control the FVP-4000T using your smartphone or tablet, using either the simple or full remote interface. It also lets you use your device's onscreen keyboard, rather than attempting to input text using the FVP-4000T's slow and cumbersome keyboard.

The Live TV app lets you watch live television from your mobile device, with content streamed from the FVP-4000T. You can also swap between channels on your mobile device and then have that content sent to your TV. Similarly, you can hit the 'Bring In' button to resume watching whatever is on your TV on your tablet; useful if anyone ever wants to commandeer the television.

After being massively impressed by Humax's Freesat boxes, it's difficult not to come away disappointed with its fledgling Freeview Play PVR. Some of the complaints can be levelled at Freeview Play itself, but the performance of the box is also poor. It lacks the refinement of Humax's other boxes and it at times feels slow and unwieldy. Jumping through channels, the most basic of tasks, is cumbersome. Aside from the excellent app support, the FVP-4000T is a bit of a let-down.

Richard Easton

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PLUSTEK eScan A150

COMPUTER SHOPPER RECOMMENDED ★★★★☆

£416 inc VAT • From www.amazon.co.uk

VERDICT
The eScan A150 is somewhat niche, but it's commendably easy to use

THIS SHEET-FED document scanner is aimed at small office users who need a quick way to archive paperwork without tying up a PC. It can be shared over a wired network or Wi-Fi, scans at up to 600dpi, can capture both sides of a page at once and reaches speeds of up to 30 sides per minute in greyscale.

The device is uncluttered and professional-looking, with a button on the top that lets you open the mechanism to get at paper jams. The front is dominated by a 17.8cm colour touchscreen. By default this shows a big
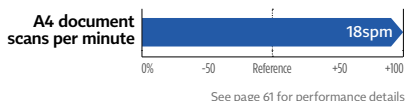
'eScan' button, and smaller buttons for settings such as resolution. At the bottom-left is a link to the system settings, which let you configure power-saving, Wi-Fi and so on.

The PC client is a simple network utility that listens for and accept scans sent by the device. The Android client is similar, although sadly it doesn't yet support Android 6 (Marshmallow). There's no TWAIN interface for the PC, so you can't control the A150 from your usual imaging app. Otherwise, the A150's way of doing things is beautifully simple: insert documents, tweak the settings and tap eScan, then wait while the touchscreen loads thumbnail views of each side. You can delete blanks, rotate in 90° steps and drag pages to the correct order before saving the scan to any PC, Mac or Android device with the client installed, or to a USB disk or cloud services.

It's a brilliant interface, but there are limitations. There's no optical character recognition built in, so if you want to create a searchable PDF you'll have to send it to a PC

and use the supplied ABBYY FineReader software. There's also no automated de-skew or blank page detection, which we'd expect on this class of scanner, and its internal storage isn't encrypted – although Plustek told us the memory is cleared after saving each job.

The A150 lived up to Plustek's speed claims, capturing simplex grey images at just over 18ppm, but it was much slower even at intermediate resolutions: it took 78 seconds to scan 10 A4 pages at 200dpi and 134 seconds at 300dpi. At 600dpi, 10 postcard-size photos took six minutes. Fortunately, scan quality was good – colours were a bit de-saturated, but the focus was sharp, and there was almost no bleed-through.

This isn't the fastest document scanner we've tested, and the extra step necessary to produce a searchable PDF could be a pain, but it offers a uniquely easy and flexible approach to scanning. It's a good choice for small firms, particularly if the staff aren't highly technical.

Simon Handby

SPECIFICATIONS
SCANNER TYPE Document scanner • **MAXIMUM OPTICAL SCAN RESOLUTION** 600x600dpi • **DIMENSIONS** 189x318x170mm • **WEIGHT** 2.8kg • **WARRANTY** One year RTB • **DETAILS** plustek.com/uk • **PART CODE** 0263UK

A4 document scans per minute		18spm
	0% -50 Reference +50 +100	

See page 61 for performance details

HP Envy 5540

★★★☆☆

£79 inc VAT • From www.uk.insight.com

VERDICT
Another adequate inkjet MFP, but it's nothing more than a workhorse

HP'S ENVY PRINTER range usually combines smart design and useful features with affordable prices. That's true of the Envy 5540, an attractive compact inkjet MFP with a touchscreen, automatic duplex printing and
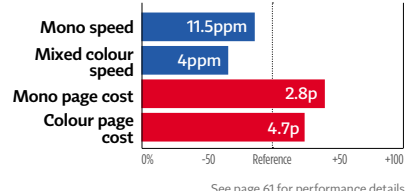
support for the latest mobile printing and cloud-based services. It connects to a single PC over USB or to a wireless network.

This printer uses cartridges with integrated print heads, so there's no waiting for the ink system to prime itself. That said, we had to re-insert the tri-colour cartridge before it was happy to proceed. In the base is a 125-page A4 paper tray, with a 6x4in photo tray above it. The latter is rated for up to 15 sheets, but the printer struggled to pick the top sheets of 10.

A sturdy output tray extends itself when you start printing. The touchscreen is only mono but is up to the company's usual high standards, with familiar tap and swipe gestures and an incredibly intuitive interface.

HP's Android app is fine, but its PC software is still over-simplified. Artefacts in higher-resolution scans suggest they've been sharpened, and there's no facility to turn this off. At least the Envy 5540 could scan properly at 1,200dpi, unlike some HP MFPs.

It proved fast over a USB connection, reaching 11.5ppm on our formal letter test and 12.7ppm at draft quality. At 4ppm, colour speed was also good. Scan speeds were less impressive, however, with a preview taking 22 seconds, a 300dpi A4 scan 25s and our 1,200dpi photo scan almost three minutes. A4 photocopies took 24 seconds in black and 37s in colour. Scan quality was fine, sharpening aside, while plain paper print and photocopy quality was great. Photos were unimpressive on HP's Premium Plus paper, however, with dark colours lacking in saturation.

The Envy 5540 is compatible with HP's Instant Ink system, where you pay a monthly subscription to have ink cartridges delivered as you need them. It's a smart idea, and with the correct plan it should offer savings on the 7.4p per page cost of buying XL cartridges. All the same, we'd give the 5540 a miss: Canon's Pixma MG6650 beats it in almost every way.

Simon Handby

SPECIFICATIONS
TECHNOLOGY Thermal inkjet • **MAXIMUM PRINT RESOLUTION** 4,800x1,200dpi • **MAXIMUM OPTICAL SCAN RESOLUTION** 1,200x1,200dpi • **DIMENSIONS** 156x454x410mm • **WEIGHT** 6.8kg • **MAXIMUM PAPER SIZE** A4/legal • **WARRANTY** One year RTB • **DETAILS** www.hp.co.uk • **PART CODE** J6U66A#ABU

Mono speed	11.5ppm	
Mixed colour speed	4ppm	
Mono page cost		2.8p
Colour page cost		4.7p
	0% -50 Reference +50 +100	

See page 61 for performance details

WESTERN DIGITAL My Passport X 2TB

★★★☆☆

£90 inc VAT • From www.dabs.com

VERDICT
Marketing aside, there's nothing special about this 'Xbox' hard disk

WE'VE SEEN PLENTY of hardware marketing gimmicks in our time, but none so transparent as Western Digital's 'Xbox-ready' USB3 hard drive. Any NTFS-formatted external USB hard disk will work with your Xbox One or 360, and that's exactly what the My Passport X is – a pre-formatted, 2TB portable USB disk that's really no different from any other.

There's certainly little to set the My Passport X apart from any other portable USB

disk for performance. It reads and writes huge files at an average speed of 106MB/s. Large files were written at 105.8MB/s and read at 101.7MB/s. Small files were written and read at an average of 104.9MB/s. You won't run games or load saved data any faster with this portable hard disk than with any other. These scores are very much in line with what we'd expect from a USB3 portable disk. That's no surprise, as inside the My Passport X is a WD Green 2½in SATA disk with 8MB of cache.

The My Passport X does feature a few modest customisations for its intended use with an Xbox. Its striped black appearance is reminiscent of the Xbox One, and it comes with a relatively long 47cm Micro USB3 cable, so you should be able to position the disk safely next to or on top of your console.

The My Passport X will of course work with a PlayStation 4 when reformatted as FAT32, although Sony's console allows you to save only game data to external storage.

Microsoft allows Xbox One users to save games to USB storage.

This hard drive can of course be used with a Windows PC or Mac too. In line with its console focus, it comes without any backup software but it'll work just fine with your desktop or laptop. The three-year RTB warranty may seem lengthy at first glance, but that's fairly standard for external USB storage.

Western Digital's My Passport X isn't a bad portable USB3 disk, but the way it's being marketed is very cheeky and it's overpriced at £90 or 5p per gigabyte. This compares poorly with other USB3 portable disks such as the 2TB Toshiba Canvio Basics, which costs just £50 or 3p per gigabyte – almost 50% less. Unless you're particularly keen on its black stripy looks or you can find it cheaper elsewhere, there's little reason to choose this 2TB USB3 portable disk over any other – whether you own an Xbox or not.

Alan Lu

SPECIFICATIONS
CAPACITY 2TB • **COST PER GIGABYTE** £0.05 •
INTERFACE USB3 • **WARRANTY** Three years RTB •
DETAILS www.wdc.com • **PART CODE** WDBCRM0020BBK

Huge files	106MB/s
Large files	103.8MB/s
Small files	104.9MB/s

0%   -50   Reference   +50   +100

See page 61 for performance details

ASUS RP-AC56

★★★★☆

£70 inc VAT • From www.lambda-tek.com

VERDICT
A chunky wireless extender with dubious music features, but good performance

THE RP-AC56 IS a wireless range extender that doubles as an audio streamer, but there are caveats when using it for either purpose. The chunky white box plugs directly into your wall socket. Its girth can foul adjacent sockets, and this isn't helped by the antennas on either side, so you may need an extension lead.

With the RP-AC56 placed within reach of your router, pressing the WPS button on both devices sets it up automatically. If your router doesn't support WPS, you can use Asus's simple web admin interface instead. In either case, the process takes mere minutes.

You should generally keep your expectations in check with range extenders, as most tend to suffer from slow performance

even if they extend your router's range. The RP-AC56 fits this trend, starting well at 25m over the 2.4GHz band, where it produced 27.8Mbit/s, compared with the router's 33.7Mbit/s.

At 35m we couldn't get a reliable signal from the router alone, but the RP-AC56 managed a respectable 16Mbit/s. On the 5GHz band it achieved 30.4Mbit/s at 25m, which compares poorly with the router's 42.8Mbit/s, but at least the speed didn't drop much at 35m where it managed a decent 28.7Mbit/s.

Using a Tenda W900U USB 802.11ac adaptor, we recorded speeds of 49.8Mbit/s at 25m and 24.5Mbit/s at 35m. This compares well with the router's scores of 117.6Mbit/s at 25m and no reliable signal at 35m.

Oddly, the audio streaming feature works only with iOS and Android devices. To use it, simply plug a set of speakers into the RP-AC56's 3.5mm audio port and download Asus's AiPlayer app to your mobile device. While the iOS version of the app worked well,

the Android version repeatedly crashed until we restarted our Android Lollipop device.

AiPlayer looks dated but it worked well enough for streaming music stored on your mobile device to the RP-AC56. There's no way to get cloud music streaming apps such as Spotify to work with the Android version of AiPlayer, though, which limits its usefulness. On iOS, AiPlayer appeared to use AirPlay but the app was very buggy, with laggy playback controls. Other AirPlay-compatible music apps sometimes dropped the connection.

If you accept its limitations, the RP-AC56 works fairly well as a wireless range extender and audio streamer, but we'd use a Powerline networking kit, such as the Devolo dLAN 1200+ WiFi ac, unless the layout or wiring of your home makes this impractical. For audio streaming, dedicated kit such as Google's excellent Chromecast Audio is a better bet.

Alan Lu

SPECIFICATIONS
MODEM N/A • **WI-FI STANDARD** 802.11ac •
STATED SPEED 1,167Mbit/s • **USB PORTS** 0 • **WALL
MOUNTABLE** No • **WARRANTY** Three years RTB •
DETAILS www.asus.com • **PART CODE** RP-AC56
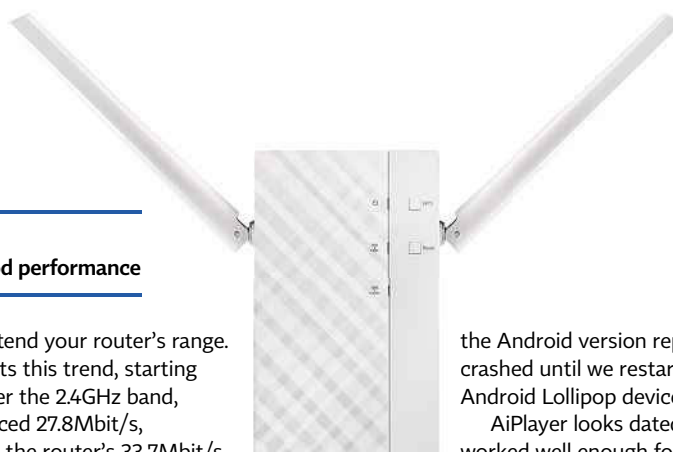
SYNOLOGY Router RT1900ac

★★★★☆

£130 inc VAT • From www.span.com

VERDICT
A router that's easy to set up, with lots of advanced features, but performance is patchy

SYNOLOGY IS BEST known for its excellent range of NAS devices, so we were surprised to see that it had launched a router. The company isn't renowned for eye-grabbing design, and in an age of ever flashier-looking routers, Synology's simply named Router RT1900ac uses a plain black-plastic casing.

The only touch of aesthetic originality is the pair of fixed feet at the back, which raise the router up by a few centimetres. There's no version with a built-in ADSL modem, so ADSL and cable customers alike will have to plug their existing modem into the WAN port.

Like most routers, the RT1900ac generates a fair amount of heat, so you'll want to keep in a well-ventilated area. For security, there's a button alongside the WPS button for turning off Wi-Fi without turning off the router.

The RT1900ac is easy to set up. Once it's plugged into your home network, typing *router.synology.com* in your browser on a networked PC will take you to a simple web-based setup wizard. Unlike many routers, it wisely prompts you to set a username and administrator password. It also asks you to choose an SSID and password, so your wireless network is protected from the start.

Like Synology's NAS devices, the RT1900ac is very easy to customise, as its web interface resembles a PC's, with icons, a taskbar and a desktop. You can even create shortcuts for frequently used settings. All the features you'd expect are there, including a DMZ, port forwarding, IPv6 support, the ability to set up a guest network and MAC address filtering.

The device supports a huge range of Dynamic DNS services, including Synology's own, which is free. Anxious mums and dads will appreciate the parental controls, which are extensive and surprisingly easy to set up. You can make whitelists and blacklists and schedule which times of day each device can access the internet.

An alternative to the web interface is the app for iOS and Android. This doesn't have anything like the full range of features available in the web interface, but it works well for changing parental controls quickly or checking the various security settings.

As you'd expect from a NAS manufacturer, the RT1900ac lets you plug in a USB disk or SD card and share files among all your networked computers – in effect creating a NAS on the cheap. It works exactly like a Synology NAS, which also means you can add a range of extra features from Synology's app store. Whether you want to stream media, host a blog or run a VPN server, there's probably an app for it. You can even use the USB port to share a printer among all your networked computers, or use a 3G or 4G dongle as a fall-back connection.

This would all be for nothing if the RT1900ac's range and performance weren't up to scratch. Sadly, this is where Synology's router comes up a little short. When used with our laptop and its built-in 802.11n Intel adaptor, it managed 45.8Mbit/s at 10m and 33.7Mbit/s at 25m over the 2.4GHz band, which are good scores. On the 5GHz band, it initially did very well with 149.1Mbit/s at 10m, falling to a disappointing but still usable 42.8Mbit/s at 25m.

Synology doesn't produce its own 802.11ac adaptor, so we used Tenda's W900U USB adaptor to test 802.11ac speeds. The RT1900ac managed 146.8Mbit/s at 10m, and 111Mbit/s at 25m. Although disappointing for an 802.11ac router, the drop in performance between 10m and 25m was at least relatively small. Only at 35m away, with several metal cupboards in the way, did we lose the signal.

We're looking forward to seeing more routers from Synology, purely because of the slick, easy-to-use interface and abundance of features. The app support and ability to turn it into a basic NAS are incredibly useful, and if you have an old USB hard disk or SD card lying around, it's significantly cheaper than buying a dedicated NAS device.

Unless these factors are paramount, however, the Router RT1900ac's inconsistent performance at long range could be a problem for those looking to create a large wireless network. At this price, we'd rather have the TP-Link Archer C9. Its interface is nowhere near as slick, but its performance is superior.

Alan Lu
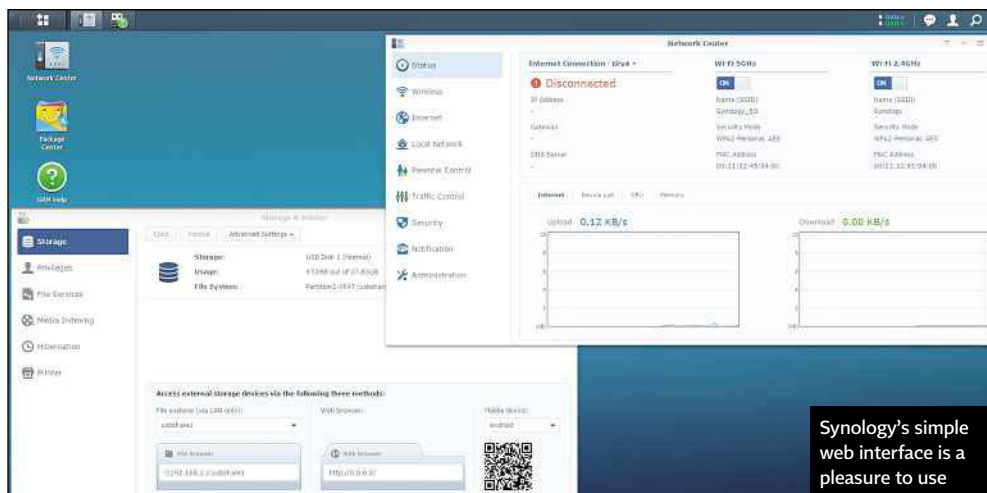
Synology's simple web interface is a pleasure to use

SPECIFICATIONS

MODEM None • **WI-FI STANDARD** 802.11ac • **STATED SPEED** 1,300Mbit/s • **USB PORTS** 1x USB3 • **WALL MOUNTABLE** Yes • **WARRANTY** Two years RTB • **DETAILS** www.synology.com • **PART CODE** RT1900ac

CENTRINO 802.11n

2.4GHz 10m	45.8Mbit/s
2.4GHz 25m	33.7Mbit/s
5GHz 10m	149.1Mbit/s
5GHz 25m	42.8Mbit/s

0%   -50   Reference   +50   +100

USB ADAPTOR 802.11ac

5GHz 10m	146.8Mbit/s
5GHz 25m	111Mbit/s

0%   -50   Reference   +50   +100
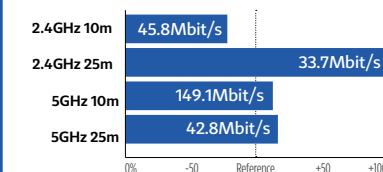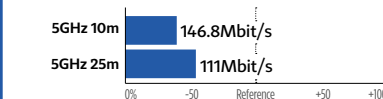
See page 61 for performance details

Wide, Beautiful
Curved
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The gentle curve of the Philips Curved UltraWide display puts you at the center of the desktop for a truly immersive experience like never before. On top of that, integrated speakers with DTS Sound™ deliver realistic stereo sound to bring your entertainment to life.

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CurvedDisplay

21:9
UltraWide

IPS
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www.philips.com/lcdmonitors

PHILIPS

AMD A10-8700B 'Carrizo'

★★★☆☆

VERDICT

The first chip we've seen from AMD's new laptop processor range has acceptable 2D but underwhelming 3D performance

AMD'S FIRST ACCELERATED Processing Unit, codenamed Llano, was impressive when it launched in 2011. It couldn't quite compete with the Intel competition for raw processing power, but it blew Intel's chips away in games.

Llano was followed a year later by the equally impressive Trinity architecture, and then by Richland and Kaveri in 2013 and 2014. Unfortunately, as much as we liked these chips, few PCs and hardly any laptops used them. This is a shame because APU-powered laptops in particular could have been real budget or mid-range contenders.

AMD hopes to change that with Carrizo. Again, it's designed for budget to mid-range laptops, but according to the company, "more people buy notebooks priced between $400 (around £250) and $700 (around £450) than at any other price" and this "by both volume and revenue, makes up the largest segment in the entire PC market".

ARCHITECTURE AND RANGE

Carrizo chips are based on a 28nm process and can have a Thermal Design Power (TDP) as low as 12W, depending on the laptop manufacturer's requirements. This puts them on a par with low-power Intel chips such as the Core i3-4030U. Depending on the model, the architecture consists of one or two dual-core Excavator processing modules and six to eight graphics cores.

Each Excavator module consists of two cores, and each module shares a 1MB block of L2 cache. All but the lowest-spec chip have two Excavator modules, making them quad-core processors. AMD says the processors can be configured to stick to a certain TDP, so laptop manufacturers can strike their preferred balance between processing speed, power drain and how much heat the chip produces. There are also variations in how fast the graphics cores run – see the table below.

OUR TEST LAPTOP

We tested Carrizo in an HP Envy 15-AH000SA laptop. This 15in model costs £400 from *www.currys.co.uk* and uses an AMD A10-8700B chip, which is one down from the top chip in the Carrizo range. This means it's a quad-core processor running at up to 3.2GHz, with six 800MHz graphics cores. It also has 8GB of RAM. We pitted it against HP's Pavilion x360 13-A008Ne, which is powered by a 1.9GHz Core i3-4030U Intel processor and is slightly cheaper than the AMD-equipped HP Envy.

Our application benchmarks test single-core performance by manipulating large images, multicore performance by encoding a 4K video file, and multitasking performance by manipulating images while encoding and playing back a 4K video all at the same time.

Performance was similar across all three benchmarks, with the AMD chip having a slight edge. The AMD laptop scored 52 compared with the Intel model's 49 for image editing, 36 versus 32 in video editing and eight versus seven in the multitasking test. According to CPU-Z, HP had locked the Carrizo chip to a 15W TDP. Clock speeds boosted to 3.2GHz when processing images, but didn't get above 2.3GHz when encoding video – probably to stay within the TDP limit. Performance is fine for Windows use, but you'll need a beefier chip for video editing.

PLAY TO WIN

As with its previous APUs, AMD is keen to highlight Carrizo's gaming prowess. This is still a low-power processor, so don't expect to play Fallout 4 on it, but AMD thinks it's suited to Multiplayer Online Battle Arenas (MOBAs) such as DOTA 2.

We usually test integrated graphics using racing title Dirt Showdown, as it scales well to lower-powered hardware. In our standard test, which runs at 1,280x720 with High detail and 4x anti-aliasing, we saw 21.1fps from the Carrizo A10-8700B, which is only slightly better than the 18.9fps from an Intel Core i3 and too jerky to be playable. We had to turn off anti-aliasing and reduce quality to Medium to see a playable average of 35.6fps – slightly quicker than the 32.2fps we saw from the Intel Core i3 laptop, but far from spectacular.

We also tested with Blizzard's MOBA Heroes of the Storm, a popular online title. In a two-minute stretch of the first training mission, we saw 43.7fps from the AMD A10-8700B, dropping to 11fps at one point. The Intel Core i3 laptop was smoother, with an average of 49.7fps and a 17fps minimum.

DRAIN TIMETABLE

The laptop lasted 5h 41m in our battery test, which is reasonable for a budget model, but until we see more laptops with AMD Carrizo chips we can't come to a definite conclusion about battery life. The fact that the chip has a similar TDP to its Intel rivals makes us think there won't be much difference.

For performance, we're less convinced by AMD's new processor. In 2D applications and games it has similar performance to lower-end Intel Core i3 chips, which are available in laptops costing £350 or less. We may see cheaper Carrizo laptops in the future, and we've yet to see the top-of-the-range AMD A12-8800B, but so far AMD's new laptop chips leave us distinctly underwhelmed.

Chris Finnamore

SPECIFICATIONS

SOCKET FP4 ● **CORES** 4 ● **FREQUENCY (BOOST)** 1.8GHz (3.2GHz) ● **INTEGRATED GRAPHICS** AMD Radeon R6 ● **WARRANTY** N/A ● **DETAILS** www.amd.com ● **PART CODE** AM870PAAY43KA

Windows overall	24
Multitasking	8
Dirt Showdown 720p	21.1fps

0%   -50   Reference   +50   +100
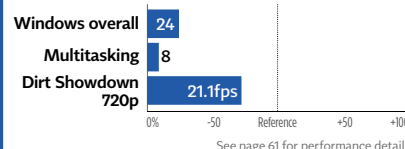
The AMD Carrizo range

MODEL	GRAPHICS BRAND	TDP	CPU CORES	GPU CORES	CPU CLOCK (MAX)	GPU CLOCK (MAX)	TOTAL L2 CACHE
AMD A12-8800B	AMD Radeon R7 Graphics	12-35W	4	8	UP TO 3.4GHz	800MHz	2MB
AMD A10-8700B	AMD Radeon R6 Graphics	12-35W	4	6	UP TO 3.2GHz	800MHz	2MB
AMD A8-8600B	AMD Radeon R6 Graphics	12-35W	4	6	UP TO 3.0GHz	720MHz	2MB
AMD A6-8500B	AMD Radeon R5 Graphics	12-15W	2	4	UP TO 3.0GHz	800MHz	1MB

ACDSEE
ACDSee Ultimate 9

★★★☆☆

£70 inc VAT • From www.acdsee.com

VERDICT
An ambitious update, but ACDSee Ultimate 9 isn't as integrated or as elegant as it could be

ACDSEE'S PHOTO-MANAGEMENT and processing suite incorporates non-destructive Raw editing, map plotting and online sharing. Adobe Lightroom offers the same features, so any rival has its work cut out to compete.

Where ACDSee differs is in its Edit module, where photos are edited destructively, changing the pixel data. Destructive editing means it's not possible to go back and tweak or undo settings at a later date, but it usually provides a broader range of editing tools.

Edit mode now supports layers, masks to hide pixels without deleting them, and adjustment layers for applying filters non-destructively. This adds to the confusion of which parts of the software are destructive and non-destructive, but the prospect of full layer-based editing alongside Raw processing is appealing. Lightroom users must fire up Photoshop when they want to manipulate images on multiple layers.

Sadly, the reality doesn't live up to expectations. ACDSee's layer-based editing functions lack Photoshop's sophistication, and the controls were often slow to respond.

We like the idea of Raw processing and layer-based destructive editing in a single app, but Develop and Edit modes feel like two discrete applications. Adjustments made to Raw files in Develop mode must be saved as an 8-bit file before they can be brought into Edit mode. Taking an image with layers from Edit to Develop mode isn't allowed at all.

Dehaze is new in version 9, and offers to bring out details in hazy, low-contrast areas. A
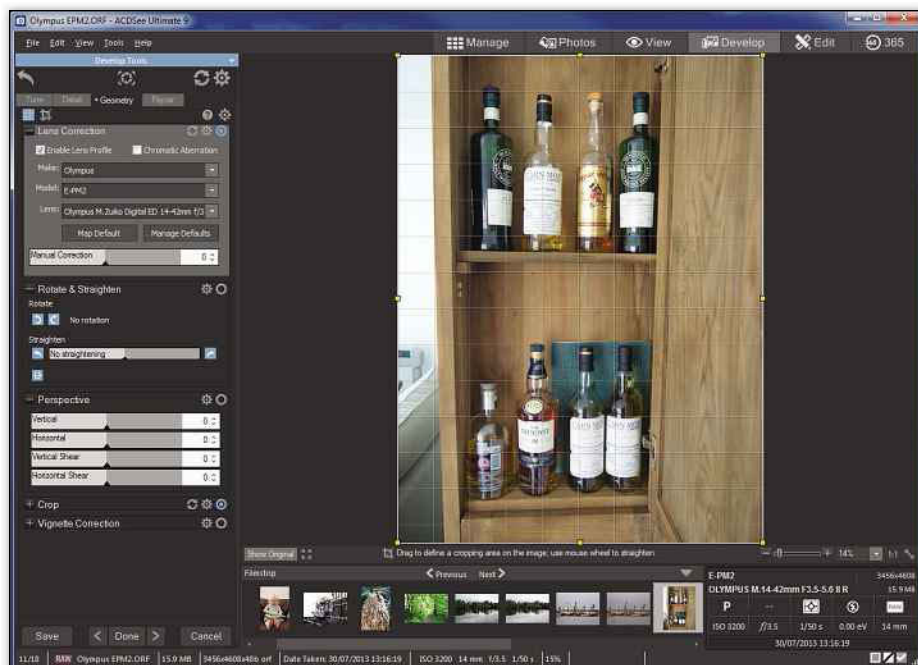
⬆ ACDSee finally includes profile-based lens corrections, but applying them isn't as easy as it should be

feature with the same name in Lightroom 6 does a good job, but ACDSee's implementation tended to make less hazy areas of the frame too dark. One of the main reasons to shoot in Raw format is the ability to bring out subtle details, but because ACDSee's Dehaze filter appears in its Edit mode, it can't access the Raw data. The result was a tendency towards colour banding, noise and odd colours.

ACDSee can filter the photo library by a wide range of criteria, but while some options, such as lens model, give a list of specific lenses that appear in the library, others are unhelpfully predefined. For example, it can filter to show all the photos in Canon, Nikon or Olympus Raw format, but not Panasonic Raw. Selecting Sony Raw reveals no matches. The software can work with these Raw files, but the library filter doesn't seem to know it. The software recognised Raw files from all the cameras we've reviewed in the past 12 months.

Another long-standing issue is the lack of lens profiles for automatic correction of lens distortions. This is offered by Lightroom, and while useful for SLR lenses is absolutely essential for an increasing number of CSC and premium compacts. These lenses exhibit

heavy distortion so it's down to software – either in-camera or in Raw-processing software – to correct it. Lens profiles are now included in ACDSee 9, but while the database of lenses looks pretty thorough, there are still a lot of gaps. Profiles aren't applied to Raw files by default, and the software seemed unable to read metadata correctly in order to pick out the correct profile automatically.

Navigating the library is quick, and we like the new Photos View that packs the screen with small thumbnails. However, Develop and Edit modes aren't so responsive, and manipulating images in Develop mode is slow when noise reduction has been applied. This is particularly troublesome when using the Develop brush to target small areas of the frame for colour correction; applying brush strokes caused the preview to disappear completely as the noise reduction was reapplied. A new Snapshots function saves and recalls specific processing settings in Develop mode, but we miss Lightroom's full Undo history to jump back and forth through.

There's still a lot to like here. Library management is impressively fast and mostly straightforward, and there are some impressive colour-correction filters, such as Light EQ, which gives surgical control over the brightness and contrast of images. However, Lightroom has the advantage in almost every other area: for its integrated non-destructive workflow, comprehensive Raw support and lens profile library, and for noise reduction quality. Overall, it feels more polished and in tune with photographers' needs. When paired with Photoshop CC as the Creative Cloud Photography Plan, it's a force with which ACDSee Ultimate can't compete.

Ben Pitt

⬆ ACDSee can show photos' location based on embedded GPS data

SPECIFICATIONS

OS SUPPORT Windows 7 (SP1)/8/10 (64-bit only) ●
MINIMUM CPU 2GHz ● **MINIMUM GPU** 512MB DirectX 10 ●
MINIMUM RAM 2GB (6GB recommended) ● **HARD DISK SPACE** 2GB ● **DETAILS** www.acdsee.com

Your train hide-out isn't immune from Templar attack

UBISOFT Assassin's Creed Syndicate

★★★☆☆

£32 inc VAT • From shop.ubi.com

VERDICT
An enjoyable if repetitive romp through Victorian London, but it fails to move the series forward

THE LONDON OF Syndicate's 1868 is a city of dreams. It's a place where indestructible horses run riot across gloriously wide streets, trampling over wrought-iron lamp-posts as if they were made of matchsticks. A place where every major station has an interconnected steam railway, street urchins carry £500 in pocket change, and almost every building is the same height, allowing London's landmarks to rise up out its murky smoke stacks like a carefully coiffured Victorian topiary garden.

It wouldn't do to get too hung up on all the incongruous details – Assassin's Creed games are churned out on a yearly basis, after all – but it's still jarring to see St Pancras on what is essentially Oxford Street and Whitechapel plonked directly above the City of London.

However, there are moments when Syndicate gets it right, providing an uncannily nascent glimpse of the London we know today. Trafalgar Square is particularly brilliant, if only because it lets you clamber over the bronze lions at Nelson's Column without being hauled off by the nearest bobby. The same goes for the areas around Soho and Covent Garden, as the sheer number of famous landmarks gives you a firm sense of place among the rabble at street level.

It's a shame, then, that you spend so much time in the least-recognisable parts of the city, where the bland street furniture and homogenous architecture of Syndicate's Southwark and Lambeth could easily have been lifted from any lane in Unity's revolutionary Paris. Unity's frame-rate-crippling hordes of NPCs are dramatically reduced in Syndicate, leaving the game feeling much more technically proficient. However, it's a shame that Ubisoft has sacrificed that classic Victorian busyness and overcrowding for the sake of a glitch-free adventure.

Thankfully, Syndicate has a much more jovial sense of humour than Unity, thanks in part to sibling rivalry between its twin lead Assassins. Once you get to the Big Smoke, you can switch between Jacob and Evie Frye at will, although some missions require one or the other. Each one can use the same weapons, which extend to cane swords, knuckle-dusters and kukri blades. Their shared DNA diverges later in the game when you finally unlock a grand total of four character-specific skills, but for the most part they play identically.

Still, the rough and ready combat makes a change from previous Assassin's Creed titles, and Evie in particular is refreshingly feisty for a female lead. The addition of electric bombs and hallucinogenic darts make for some brilliant stealth takedowns, too.

You can take those brawls on the road, too, taking the reins of a passing carriage and hauling its driver on to the cobbles. Fighting atop vehicles isn't the most elegant or intuitive way of scrapping with rival gang members, but the ability to jump between nearby carriages at least gives you the opportunity to give them the slip if they prove too troublesome. Then again, when every horse handles like an opium-fuelled drug mule, you're probably better off walking and losing your enemies down an alley instead.

Gang warfare plays a crucial role in Syndicate, as bringing each borough back under your control helps weaken your main adversaries, the ever-present Templars. To do this, you'll need to assassinate key Templar targets, capture key figures by throwing them in a carriage and delivering them to the police, eradicating Templar control over child workhouses and raiding gang strongholds.

They're a diverting enough pastime away from the main story missions, and it's a pleasant relief to see that your map isn't bursting with icons and collectible knick-knacks this time. However, these side quests begin to tire when they start to crop up elsewhere, particularly in the additional character memory missions. Here, you do the bidding of famous historical figures such as Karl Marx and Charleses Dickens and Darwin, but when each task is just another watered-down version of the gang missions, the limits of Syndicate's appeal begins to show.

This lack of depth is a perennial problem with Assassin's Creed games, and Ubisoft could do with giving the series a year off to give it some time to take stock and reassess its strengths. Syndicate does address many of Unity's problems, particularly its overall stability and making it easier to free-run and climb into buildings, but underneath it does little to move the franchise forward. It's still enjoyable, but when so much is reused and recycled, it feels like Ubisoft is simply going through the motions instead of making its players hungry for more.
Katharine Byrne
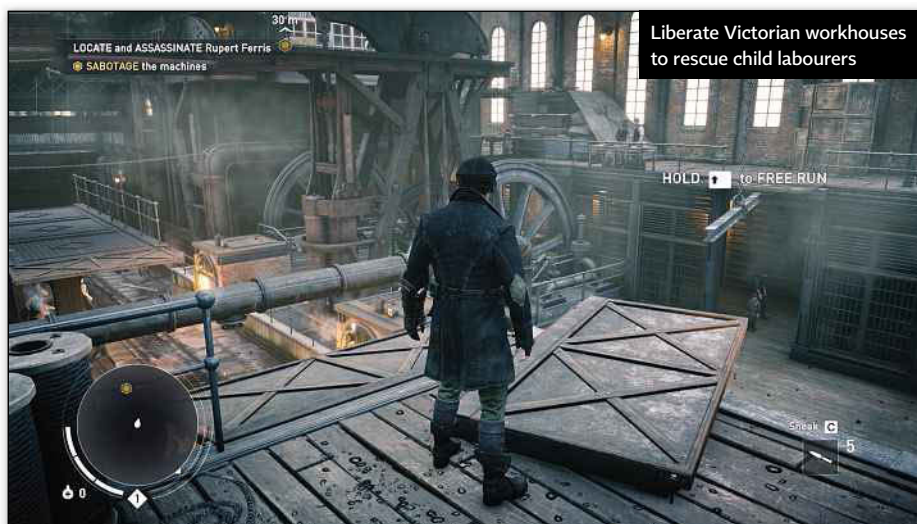
LOCATE and ASSASSINATE Rupert Ferris
SABOTAGE the machines
Liberate Victorian workhouses to rescue child labourers
HOLD ☐ to FREE RUN

SPECIFICATIONS
AVAILABLE FORMATS PS4, Xbox One, PC ● **OS SUPPORT** Windows 7 SP1 64-bit, Windows 8/8.1 64-bit ● **MINIMUM CPU** Intel Core i5-2500K 3.3GHz, AMD FX-8350 4GHz or AMD Phenom II x4 940 3GHz ● **MINIMUM GPU** Nvidia GeForce GTX 680 or AMD Radeon HD 7970 (2GB VRAM) ● **MINIMUM RAM** 6GB ● **HARD DISK SPACE** 50GB ● **DETAILS** www.ubisoft.com
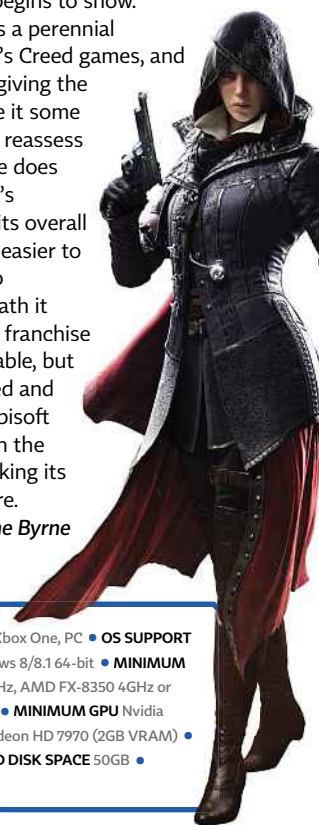
BETHESDA
Fallout 4

COMPUTER SHOPPER ★★★★★
BEST BUY £40 inc VAT •
From store.steampowered.com

VERDICT
With new base-building mechanics and a densely packed wasteland, Fallout 4 is sublime

Super Mutants: big, ugly, and rarely friendly

SUPER MUTANT SKIRMISHER

Discovered
WEST ROXBURY STATION
+ 0024 XP

CRIT
[Space] EXECUTE CRITICAL   [Tab] ABORT

FALLOUT 4 IS a massive game, and after 80 hours, we don't feel we've seen half of what's on offer. In that time, however, it's clear that this is the best 3D Fallout yet.

It was an open secret that the game opens before the bombs drop and the world 'ends'. You'll experience the 1950s-inspired world first hand, before making your way to an iconic Vault and riding out the apocalypse. When you eventually emerge, Bethesda has done a brilliant job giving players a reason to explore every inch of the wasteland. The story is packed with emotional punch, unique characters, and surprising set pieces that feel different from any previous Fallout.

Interactions with NPCs were previously limited to written text, but all the dialogue is now voiced. As a result there are fewer conversation options, and your S.P.E.C.I.A.L. attributes don't seem to unlock extra choices, but your character having a voice makes it feel like you're actually a part of the world, even if you lack the unmistakeable Boston accent.

Moving the action to Boston provides a greater insight into Fallout's many factions. The Brotherhood of Steel has a much smaller presence here, but you do get to learn more about the mysterious Institute. Locations from American history get a post-apocalyptic makeover, including turning Fenway Park baseball stadium into Diamond City, one of the biggest settlements in the wasteland.

Fallout 4 is pretty, albeit not breath-taking. Bethesda has nailed the post-apocalyptic look, combining pre-war style with blown-out buildings, scavenged parts and 1950s sci-fi. Every location oozes atmosphere and is jammed with detail. Character animations are improved and faces look far more natural, too.

The world map isn't as large as Skyrim's, but it's more densely packed; walk a minute in any direction and you'll find a new location to explore. Boston weather is notoriously changeable, and it's no different in 2277, with fog and rain storms giving areas a different feel. There are even radiation storms that force you to find shelter, with lightning illuminating your surroundings and radiation clouds giving everything an alarming glow.

Beyond looks, Bethesda has tweaked the Fallout formula in virtually every way. The best example is the series' iconic Power Armour: it used to be a mid-game reward, but now, one of the first story missions outside of Vault III puts you inside the suit, defending a group of stranded settlers from a raider attack. Once the mission is over, you're free to use Power Armour for the rest of the game.

This will shock long-standing Fallout fans, but don't panic. Without a fusion core to power your suit, you can barely move in it. Fusion cores are rare, and are quickly depleted, meaning Power Armour is best saved for fighting super mutant behemoths or

Deathclaws. Seeing yourself climb inside the suit is immensely satisfying, as is the onscreen display that replaces the standard HUD and pip-boy menu screen.

Real-time combat feels more visceral, and it helps that there's a huge selection of weapons. Scavenged pipe rifles, made with wooden blocks, duct tape and tin cans, fit the post-apocalyptic world perfectly, but they don't exactly pack a punch: you'll soon want to migrate to laser rifles and mini-nuke launchers. Because your weapons no longer degrade, you don't need to hoard guns in order to keep your favourites maintained.

Instead, you can focus on finding the weapon that suits your play style best, then modifying it at a work bench. This means ripping optics from microscopes, gears from clocks and circuitry from broken Protectron robots to build each new upgrade.

This is just the tip of the iceberg when it comes to scavenging. A fully featured base-building system encourages you to collect everything. Many settlements are strewn across the wasteland for you to liberate and rebuild, and with each one you increase your standing with the Minutemen faction.

War might never change, but Fallout 4 represents a shift for the series. There's a much larger focus on the player's part in the world, as well as their personal reasons for exploring it. Post-apocalyptic Boston is filled with enough locations, items and NPCs to keep you exploring for well over 100 hours, and with no level cap, a base-building mechanic that encourages exploration and an enormous collection of side missions, there's an insane amount of content here.

There are a few glitches and slowdowns that hopefully Bethesda will iron out with a post-launch patch, but not enough to lower our opinions. It's undoubtedly a Best Buy, and a real contender for game of the year, too.

Tom Morgan
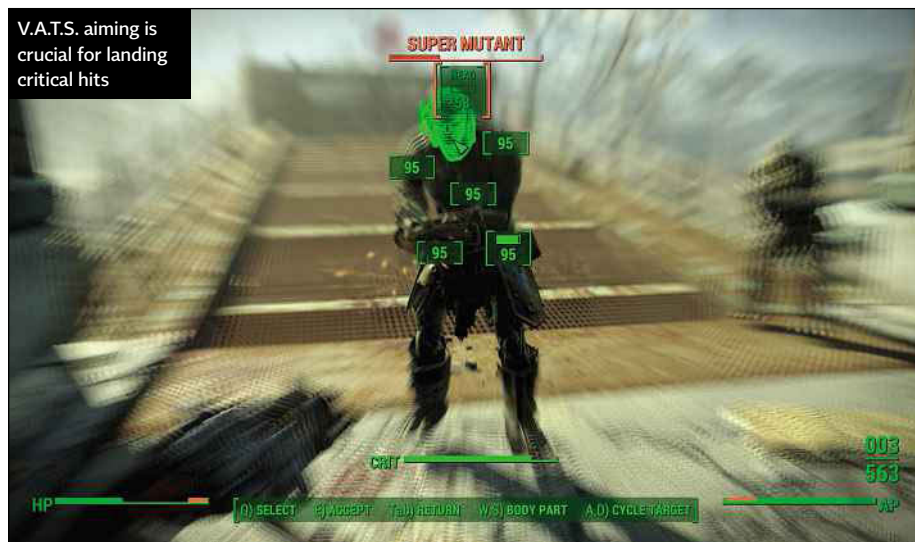
V.A.T.S. aiming is crucial for landing critical hits

SUPER MUTANT
HP   CRIT   AP
[Q] SELECT   [E] ACCEPT   [Tab] RETURN   [W,S] BODY PART   [A,D] CYCLE TARGET

How we test

Find out how well products perform with the help of *Computer Shopper*'s comprehensive tests

COMPUTER SHOPPER'S REVIEWS use some of the most exhaustive testing procedures you'll find in any PC magazine. Every product is subjected to qualitative and quantitative tests that show how it performs in practical use. Graphs for performance, battery-life scores and costs are used in the *Reviews* section, as shown on the right. Look in the 'Summary of tests' table (below) for details of each test we run.

For PCs and laptops, we evaluate performance using our own custom benchmarking suite. See below for a brief description of our benchmarking software and game tests.

The actual scores in each test are shown inside each bar

Normal speed	11ppm
Mono costs	2.2p
Colour costs	6.7p

0%   -50   Reference   +50   +100

Bigger is better for all bars except the red ones, which show running costs

A product hitting the +100 per cent mark performed twice as well as our reference

This line represents the performance of a reference product in each test. All graphs for components and systems are relative to our reference PC (see below for specifications)

SUMMARY OF TESTS

PC SYSTEMS

Windows overall	Average speed across numerous demanding tasks
Multitasking	Speed when running simultaneous applications
Dirt Showdown (1080p)	Frames per second at 1,920x1,080, 4xAA, Ultra detail
Metro: Last Light Redux	Frames per second at 1,920x1,080, SSAA, Very High detail

LAPTOPS

Windows overall	Average speed across numerous demanding tasks
Multitasking	Processor-intensive multitasking test
Dirt Showdown (720p)	Frames per second at 1,280x720, 4xAA, High detail
Battery life	Run time in minutes for continuous video playback

SMARTPHONES/TABLETS

Battery life	Run time in minutes for continuous video playback

PRINTERS AND MFPs

Mono text speed	Pages per minute for correspondence-quality text
Mixed colour speed	Pages per minute for presentable text and graphics
Mono page cost	Running costs expressed as pence per page
Colour page cost	Running costs expressed as pence per page

DIGITAL CAMERAS

Battery life	Number of shots from full charge

CAMCORDERS

Battery life	Run time in minutes for recording

MP3 PLAYERS

Battery life	Run time in minutes for continuous playback

ROUTERS

Laptop 2.4GHz 10m	Mbit/s at 10m with 802.11n laptop on 2.4GHz band
Laptop 2.4GHz 25m	Mbit/s at 25m with 802.11n laptop on 2.4GHz band
Laptop 5GHz 10m	Mbit/s at 10m with 802.11n laptop on 5GHz band
Laptop 5GHz 25m	Mbit/s at 25m with 802.11n laptop on 5GHz band
802.11ac adaptor 10m	Mbit/s at 10m with an 802.11ac adaptor
802.11ac adaptor 25m	Mbit/s at 25m with an 802.11ac adaptor

NETWORK-ATTACHED STORAGE

Large files	Average MB/s for read/write of 100MB large files
Small files	Average MB/s for read/write of 100MB small files

HARD DISKS

Extra large files	Average MB/s for read/write of a single 2.5GB file
Large files	Average MB/s for read/write of 2.5GB of large files
Small files	Average MB/s for read/write of 2.5GB of small files

PROCESSORS

Windows overall	Average speed across numerous demanding tasks
Multitasking	Speed when running simultaneous applications
Dirt Showdown (720p)	Frames per second at 1,280x720, 4xAA, High detail

MOTHERBOARDS

Windows overall	Average speed across numerous demanding tasks
Multitasking	Speed when running simultaneous applications
Dirt Showdown (1080p)	Frames per second at 1,920x1,080, 4xAA, Ultra detail
Dirt Showdown (720p)	Frames per second at 1,280x720, 4xAA, High detail

GRAPHICS CARDS

Dirt Showdown (1080p)	Frames per second at 1,920x1,080, 4x MSAA, Ultra detail
Tomb Raider	Frames per second at 1,920x1,080, SSAA, Ultra detail
Metro: Last Light Redux	Frames per second at 1,920x1,080, SSAA, Very High detail

BENCHMARKS

SHOPPER BENCHMARKS

Our benchmark suite uses open-source software that runs on Windows, Mac OS X and Linux systems. This lets us use objective results to compare PCs and laptops, no matter which operating system they run. It's designed to test each computer to its limit, using a combination of intensive image-editing, video-encoding and multitasking tests.

We ran the tests on our reference PC, which has an Intel Core i5-4670K processor, 8GB of DDR3 RAM and an AMD Radeon R7 260X graphics card. We normalised our results so this PC had a score of 100. This makes it easy to draw comparisons between test systems.

The resulting overall score is shown at the bottom of every PC and laptop review. As we use the same tests in our standalone and group test reviews, you can compare the performance of any computer, whether it's a netbook, laptop or desktop, from both sections of the magazine.

To see how your computer compares, you can download the suite from *www.shopperdownload.co.uk/benchmarks*. Versions are available for 32-bit and 64-bit operating systems.

3D BENCHMARKS

DIRT SHOWDOWN
Dirt Showdown is a cracking racing game that makes good use of DirectX 11's fancy graphical effects. You'll want at least 30fps for smooth racing.

TOMB RAIDER
With the ultra-demanding Super-Sampling Anti-Aliasing (SSAA) enabled, 2013's Tomb Raider reboot is a great indicator of mid-range performance.

METRO: LAST LIGHT REDUX
Our most demanding graphics test uses tessellation, SSAA and massive textures to give even high-end cards a thorough workout.

RATINGS & AWARDS

Computer Shopper rates products out of five:

Avoid	★☆☆☆☆
Below average	★★☆☆☆
Good	★★★☆☆
Very good	★★★★☆
Excellent	★★★★★

The best products can win the following awards:

BEST BUY
Products with outstanding quality and performance for the money win our Best Buy award.

COMPUTER SHOPPER
BEST BUY

RECOMMENDED
Products that don't quite qualify for a Best Buy award but are still highly rated by our reviewers.

COMPUTER SHOPPER
RECOMMENDED

BUSINESS
The very best products for work win our Business Buy award.

COMPUTER SHOPPER
BUSINESS BUY

WINNING MATTERS

powered by
GIGABYTE

KRONOS 800 - AMD Gaming PC
: AMD FX8350 4.00GHz 8x Core CPU

: NVIDIA GTX960 2GB GDDR5

: 8GB DDR3 1600MHz

: 2TB SATA III Hard Drive

: Microsoft Windows 10 (64Bit)

FROM £720.00

HELLION 800 - Intel Gaming PC
: Intel i5-4690K 3.50GHz Quad Core CPU

: NVIDIA GTX 960 2GB GDDR5

: 8GB DDR3 1600MHz

: 2TB HDD / 8GB SSD Hybrid Drive

FROM £799.00

PHANTOM 1000 - Intel O.C. PC
: Intel Core i5-6600K (Overclocked to 4.2GHz)

: NVIDIA GTX970 4GB GDDR5

: 16GB DDR4 - 2400MHz

: 2TB SATA III Hard Drive + 250GB SSD

: Microsoft Windows 10 (64Bit)

FROM £1080.00

HELLION 1300 - Intel O.C PC
: Intel Core i7-4790K (Overclocked to 4.2GHz)

: NVIDIA GTX970 4GB GDDR5

: 8GB DDR3 1866MHz

: 2TB SATA III Hard Drive + 250GB SSD

: Microsoft Windows 10 (64Bit)

FROM £1219.99

GLADIATOR COMPUTERS

HEROES OF THE STORM

Purchase a Gladiator Gaming PC with NVIDIA GTX950 / 960 inside and receive a
FREE HEROES OF THE STORM KAIJO DIABLO Bundle pack

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FREE GAME VOUCHER FOR ASSASSINS CREED SYNDICATE or TOM CLANCY's RAINBOW SIX SIEGE

0161 248 1618 | sales@gladiatorpc.co.uk | www.gladiatorpc.co.uk | Join us on

Choosing a ...

Laptop computer

01 A basic laptop costing around £300 will run everyday office, multimedia and education software, but it won't be suitable for 3D gaming. Many laptops at this price have a 15.4in screen and weigh around 2.4kg, so they're best used around the house and for occasional journeys.

02 If you want to play modern games, you'll need a laptop with a dedicated graphics chip such as the Nvidia GeForce GTX 960M. Good gaming laptops tend to have large 17in screens and weigh around 3kg, so they're best suited to use at home.

03 If you want a laptop that you can take everywhere, look for a model that weighs less than 2kg. For the best portability, buy one that has an 11in or 13in screen. In general, the smaller and lighter the laptop, the more expensive it is, especially if it has plenty of processing power.

04 Battery life is extremely important for a laptop. We'd expect all but the biggest and heaviest to last for at least five hours on a single charge, but for an ultra-portable that you carry everywhere, eight hours and above is more desirable.

05 Laptops use mobile versions of processors to conserve power, and these lag behind desktop chips for performance. For a budget laptop, an Intel Core i3 processor will do the job, but if you want better performance, look for an Intel Core i5 or Core i7 model instead. We recommend a minimum of 4GB of RAM, although 8GB is better for multitasking.

06 Most budget and mid-range laptops use a mechanical hard disk for storage. You want at least 500GB, but 1TB or more is better. SSDs have faster performance, making your computer quicker to boot and more responsive. They have lower capacities, though. You'll need at least 128GB.

07 Netbooks are a type of small, low-cost ultra-portable laptop. They're fine for light use, but avoid them if you want to do complicated tasks.

PCs

COMPUTER SHOPPER BEST BUY
ACER Revo One RL85
★★★★★

£250 inc VAT • www.currys.co.uk

One of the cleverest PC designs we've seen, the tiny Acer Revo One can house three high-capacity hard disks, making it a perfect living-room PC. With an Intel Core i3 processor, it's no slouch either, and the price is as attractive as the chassis.

PROCESSOR Dual-core 1.7GHz Intel Core i3-4005U • RAM 4GB • FRONT USB PORTS 0 • REAR USB PORTS 2x USB, 2x USB3 • TOTAL STORAGE 2TB hard disk • GRAPHICS CARD Integrated Intel HD 4000 graphics • OPERATING SYSTEM Windows 8.1 • WARRANTY One year RTB • DETAILS www.acer.co.uk • PART CODE DT.SZMEK.014 • FULL REVIEW Aug 2015

COMPUTER SHOPPER BEST BUY
PALICOMP AMD Shockwave
★★★★★

£500 inc VAT • www.palicomp.co.uk

While its AMD processor can't match the best Intel offers, Palicomp has pushed the boat out elsewhere, with a decent 4GB AMD R7 370 graphics card, bringing with it credible gaming performance at Full HD resolutions. You can't get much better for the money.

PROCESSOR Quad-core 4GHz AMD Athlon X4 860K (overclocked) • RAM 8GB • FRONT USB PORTS 2x USB3 • REAR USB PORTS 4x USB2, 2x USB3 • TOTAL STORAGE 1TB hybrid hard disk • GRAPHICS CARD 4GB AMD Radeon R7 370 • OPERATING SYSTEM Windows 10 Home 64-bit • WARRANTY Three years RTB • DETAILS www.palicomp.co.uk • PART CODE KAV2 • FULL REVIEW Jan 2016

COMPUTER SHOPPER BEST BUY
SCAN 3XS Z170 Performance GTK6
★★★★★

£1,040 inc VAT • www.scan.co.uk/3xs

Scan's first Intel Skylake PC is an incredibly powerful system that can cope with just about any desktop task and handle gaming at 2,560x1,440 thanks to an Nvidia GeForce GTX 970 graphics card. The Z170 motherboard makes it future-proof too, with USB3.1 and an M.2 slot for PCI-Express storage.

PROCESSOR Quad-core 4.6GHz Intel Core i5-6600K (overclocked) • RAM 8GB • FRONT USB PORTS 4x USB3 • REAR USB PORTS 2x USB3.1, 1x USB Type-C, 2x USB2 • TOTAL STORAGE 256GB SSD, 1TB hard disk • GRAPHICS CARD 4GB Nvidia GeForce GTX 970 • OPERATING SYSTEM Windows 10 Home 64-bit • WARRANTY Three years parts cover: first year onsite, years two and three RTB • DETAILS www.scan.co.uk/3xs • PART CODE Performance Z170 GTK6 • FULL REVIEW Nov 2015

LAPTOPS

COMPUTER SHOPPER BEST BUY
ASUS ZenBook UX305
★★★★★

£499 inc VAT • www.currys.co.uk

The UX305 is the first Asus laptop to use Intel's new low-power Core M processors. Weighing just 1.2kg and 12mm thick, it's one of the thinnest and lightest laptops we've ever tested. Its performance won't set the world alight, but if you're after a portable work machine, look no further.

PROCESSOR Dual-core 800MHz Intel Core M-5Y10c • RAM 8GB • DIMENSIONS 324x226x12mm • WEIGHT 1.2kg • SCREEN SIZE 13.3in • SCREEN RESOLUTION 1,920x1,080 • GRAPHICS ADAPTOR Intel HD 5300 • TOTAL STORAGE 128GB SSD • OPERATING SYSTEM Windows 10 Home 64-bit • PARTS AND LABOUR WARRANTY One year collect and return • DETAILS www.asus.com • PART CODE UX305FA(MS)-FC061H • FULL REVIEW Jun 2015

COMPUTER SHOPPER RECOMMENDED
TOSHIBA Satellite Radius 15
★★★★☆

£700 inc VAT • www.currys.co.uk

Recently updated with more RAM and an Intel Skylake processor, the refreshed Radius 15 retains the high quality screen, great battery life and stylish chassis. It's a great way to take advantage of Windows 10's touchscreen elements, too.

PROCESSOR Dual-core 2.3GHz Intel Core i5-6200U • RAM 16GB • SIZE 380x245x20mm • WEIGHT 2.3kg • SCREEN SIZE 15.6in • SCREEN RESOLUTION 1,920x1,080 • GRAPHICS ADAPTOR Intel HD Graphics 520 • TOTAL STORAGE 1TB SSHD • OPERATING SYSTEM Windows 10 Home 64-bit • PARTS AND LABOUR WARRANTY One year RTB • DETAILS www.toshiba.co.uk • PART NUMBER P50W-C-10P • FULL REVIEW Dec 2015

COMPUTER SHOPPER RECOMMENDED
TOSHIBA Chromebook 2 (CB30-B-104)
★★★★☆

£270 inc VAT • www.johnlewis.com

Toshiba's Chromebook 2 is the first budget Chromebook on sale in the UK to have a Full HD screen. This increases the price a little but we think it's absolutely worth it. With so much extra space, you can fit more items on the screen and get more done. The machine is lighter and has better battery life than its predecessor, too, making it our current favourite Chromebook.

PROCESSOR Dual-core 2.16GHz Intel Celeron N2840 • RAM 4GB • DIMENSIONS 320x214x19mm • WEIGHT 1.35kg • SCREEN SIZE 13.3in • SCREEN RESOLUTION 1,920x1,080 • GRAPHICS ADAPTOR Intel HD Graphics • TOTAL STORAGE 16GB SSD • OPERATING SYSTEM Google Chrome OS • PARTS AND LABOUR WARRANTY One year RTB • DETAILS www.toshiba.co.uk • PART CODE PLM02E-00D003EN • FULL REVIEW May 2015

SMARTPHONES

SAMSUNG Galaxy S6 ★★★★

SMARTPHONE

£350 (SIM-free), Free on £25-per-month contract • www.carphonewarehouse.com (SIM-free and contract)

The all-metal Galaxy S6 is one of Samsung's best phones yet. Its performance is among the best we've seen and its 2,560x1,440 screen looks gorgeous. If you want a phone that will really turn heads, though, there's also the curvy Galaxy S6 Edge.

PROCESSOR Quad-core 2.1GHz & quad-core 1.5GHz Samsung Exynos 7420 • **SCREEN SIZE** 5.1in • **SCREEN RESOLUTION** 2,560x1,440 • **REAR CAMERA** 16 megapixels • **STORAGE** 32GB • **WIRELESS DATA** 4G • **DIMENSIONS** 143x70x6.8mm • **WEIGHT** 132g • **OPERATING SYSTEM** Android 5.0 • **WARRANTY** One year RTB • **DETAILS** www.samsung.com/uk • **PART CODE** SM-G920F • **FULL REVIEW** Jul 2015

APPLE iPhone 6 ★★★★

SMARTPHONE

£459 (SIM-free), Free on £32-per-month contract • www.apple.co.uk (SIM-free), www.carphonewarehouse.com (contract)

A larger screen, faster processor and improved battery life make the iPhone 6 a huge improvement over the iPhone 5s, and it's now even cheaper as Apple makes way for the new iPhone 6s.

PROCESSOR Dual-core 1.4GHz Apple A8 • **SCREEN SIZE** 4.7in • **SCREEN RESOLUTION** 1,334x750 • **REAR CAMERA** 8 megapixels • **STORAGE** 16GB • **WIRELESS DATA** 4G • **DIMENSIONS** 138x67x6.9mm • **WEIGHT** 129g • **OPERATING SYSTEM** iOS 9 • **WARRANTY** One year RTB • **DETAILS** www.apple.com/uk • **PART CODE** iPhone 6 • **FULL REVIEW** Dec 2014

SONY Xperia Z3 Compact ★★★★

SMARTPHONE

£312 (SIM-free), Free on £18.50-per-month contract • www.handtec.co.uk (SIM-free), www.carphonewarehouse.com (contract)

With its incredible 20-hour battery life and fast performance, the Sony Xperia Z3 Compact brings flagship features to a smaller handset at a great price.

PROCESSOR Quad-core 2.5GHz Qualcomm Snapdragon 801 • **SCREEN SIZE** 4.6in • **SCREEN RESOLUTION** 1,280x720 • **REAR CAMERA** 20.7 megapixels • **STORAGE** 16GB • **WIRELESS DATA** 4G • **DIMENSIONS** 127x65x8.6mm • **WEIGHT** 129g • **OPERATING SYSTEM** Android 4.4 • **DETAILS** www.sony.co.uk • **PART CODE** Sony D5803 • **FULL REVIEW** Jan 2015

MOTOROLA Moto G (3rd Gen) ★★★★★

SMARTPHONE

£150 (SIM-free), Free on £13.50-per-month contract • www.carphonewarehouse.com (SIM-free and contract)

The Moto G just got even better. Now available with an improved camera, longer battery life and all-new design, the 3rd Gen Moto G is our go-to budget smartphone for £150.

PROCESSOR Quad-core 1.2GHz Qualcomm Snapdragon 410 • **SCREEN SIZE** 5in • **SCREEN RESOLUTION** 1,280x720 • **REAR CAMERA** 13 megapixels • **STORAGE** 8GB • **WIRELESS DATA** 4G • **DIMENSIONS** 142x72x6.1mm • **WEIGHT** 155g • **OPERATING SYSTEM** Android 5.1.1 • **DETAILS** www.motorola.co.uk • **PART CODE** XT1541 • **FULL REVIEW** Jan 2016

VODAFONE Smart Ultra 6 ★★★★

SMARTPHONE

£100 (PAYG), Free on £17-per-month contract • shop.vodafone.co.uk (PAYG and contract)

The Vodafone Smart Ultra 6 is a mid-range smartphone at an entry-level price. Packed with an octa-core processor, a huge Full HD display and a great camera, the Smart Ultra 6 is unbelievably good value.

PROCESSOR Octa-core 1.7GHz Qualcomm Snapdragon 615 • **SCREEN SIZE** 5½in • **SCREEN RESOLUTION** 1,920x1,080 • **REAR CAMERA** 13 megapixels • **STORAGE** 16GB • **WIRELESS DATA** 4G • **DIMENSIONS** 154x77x8.4mm • **WEIGHT** 159g • **OPERATING SYSTEM** Android 5.0.2 • **WARRANTY** One year RTB • **DETAILS** www.vodafone.co.uk • **PART CODE** Smart Ultra 6 • **FULL REVIEW** Nov 2015

TABLETS

SONY Xperia Z4 Tablet ★★★★★

TABLET

£499 inc VAT • www.johnlewis.com

It's expensive, but the Z4 Tablet is a stunning bit of kit. It weighs just 389g, so is lighter than the iPad Air 2, and is an amazing 6.1mm thick. Its super-high-resolution screen has the most accurate colours we've seen from an LCD panel, it runs Android 5 beautifully and has the longest battery life of any tablet we've tested.

PROCESSOR Octa-core 2GHz Qualcomm Snapdragon 810 • **SCREEN SIZE** 10.1in • **SCREEN RESOLUTION** 2,560x1,600 • **REAR CAMERA** 8.1 megapixels • **STORAGE** 32GB • **WIRELESS DATA** 4G (optional) • **DIMENSIONS** 167x254x6.1mm • **WEIGHT** 389g • **OPERATING SYSTEM** Android 5 • **WARRANTY** One year RTB • **DETAILS** www.sonymobile.com • **PART CODE** Xperia Z4 Tablet • **FULL REVIEW** Aug 2015

GOOGLE Nexus 9 ★★★★★

TABLET

£200 inc VAT • www.argos.co.uk

The Nexus 9 is the first Google-branded tablet to have an iPad-style 4:3 ratio screen, which we think is a better shape for web browsing. Android 5.0 Lollipop runs beautifully and its battery life is superb.

PROCESSOR Dual-core 2.3GHz 64-bit Nvidia Tegra K1 Denver • **SCREEN SIZE** 8.9in • **SCREEN RESOLUTION** 2,048x1,536 • **REAR CAMERA** 8 megapixels • **STORAGE** 16GB • **WIRELESS DATA** 4G (optional) • **DIMENSIONS** 154x228x8mm • **WEIGHT** 425g • **OPERATING SYSTEM** Android 5.0 • **WARRANTY** One year RTB • **PART CODE** Nexus 9 • **DETAILS** www.google.com/nexus/9 • **FULL REVIEW** Aug 2015

APPLE iPad Air 2 ★★★★★

TABLET

£399 inc VAT • www.apple.com/uk

The iPad Air 2 is even thinner and lighter than its predecessor and still feels beautifully made. It's the fastest iPad yet, and now has TouchID fingerprint recognition for added security.

PROCESSOR Tri-core 1.5GHz Apple A8X • **SCREEN SIZE** 9.7in • **SCREEN RESOLUTION** 2,048x1,536 • **REAR CAMERA** 8 megapixels • **STORAGE** 16GB • **WIRELESS DATA** 4G (optional) • **DIMENSIONS** 240x170x6.1mm • **WEIGHT** 437g • **OPERATING SYSTEM** iOS 9 • **WARRANTY** One year RTB • **PART CODE** Apple iPad Air 2 • **DETAILS** www.apple.com/uk • **FULL REVIEW** Aug 2015

MICROSOFT Surface 3 ★★★★★

TABLET

£479 inc VAT • www.currys.co.uk

If you're after a Windows tablet but the £600-plus Surface Pro 3 is too much for you, the Surface 3 is the model to get. It's beautifully made with a great screen, and if you add the optional Type Cover keyboard you'll have a super-light laptop for working on the move.

PROCESSOR Quad-core 1.6GHz Intel Atom X7-Z8700 • **SCREEN SIZE** 10.8in • **SCREEN RESOLUTION** 1,920x1,280 • **REAR CAMERA** 8 megapixels • **STORAGE** 128GB • **WIRELESS DATA** 4G (coming soon) • **DIMENSIONS** 187x267x8.7mm • **WEIGHT** 622g • **OPERATING SYSTEM** Windows 10 • **WARRANTY** One year RTB • **DETAILS** www.microsoft.com • **PART CODE** Surface 3 • **FULL REVIEW** Aug 2015

ASUS ZenPad S 8 ★★★★☆

TABLET

£170 inc VAT • www.pcworld.co.uk

Cheap rarely means perfect, but the combination of high-resolution screen and low price makes the Asus ZenPad S 8 one of the better sub-£200 tablets on the market.

PROCESSOR Quad-core 1.33GHz Intel Atom Z3560D • **SCREEN SIZE** 8in • **SCREEN RESOLUTION** 2,048x1,536 • **REAR CAMERA** 8 megapixels • **STORAGE** 16GB • **DIMENSIONS** 203x135x6.6mm • **WEIGHT** 317g • **OPERATING SYSTEM** Android 5.0 Lollipop • **WARRANTY** One year RTB • **DETAILS** www.asus.com/uk • **PART CODE** Z580C • **FULL REVIEW** Jan 2016

Choosing a ...

Smartphone

01 A smartphone's operating system (OS) dictates its basic features and which third-party software you can install. There are three main contenders: Apple's iOS, which is found on the iPhone, Google's Android, which is used by various handset manufacturers, and Windows Phone 8, which is mainly used on Lumia phones and is a great alternative to Apple's and Google's operating systems. Apple iOS and Google Android have the most apps available but Windows Phone is slowly catching up.

02 All smartphones have colour screens, but their resolutions vary. Basic models have 800x480 pixels, but text can be indistinct. Look for a display that has at least 1,280x720 pixels so it's easy to browse web pages. Don't worry too much about built-in media players or Office document editors – you can always install apps to replace these with better versions later.

The image quality of smartphone cameras has improved tremendously in recent years, and resolutions have increased to as high as 20 megapixels.

03 Very few modern smartphones have a physical keyboard for entering text: they almost exclusively use touchscreens now. Physical keyboards can aid heavy emailing, but today's touchscreen keyboards work just as well.

Android smartphones and iPhones running iOS 9 allow you to install a variety of custom onscreen keyboards so you can find one that suits you.

04 Be careful when choosing a mobile contract. Look for one that includes a large data allowance if you want to use the internet regularly or you've set your phone to synchronise your contacts, calendar and email through online services such as Google's.

Built-in Wi-Fi can help you avoid high data charges by connecting to the internet through wireless hotspots when you're out, or your router when you're at home. Android and iPhone handsets can operate as wireless hotspots, enabling you to connect your laptop to the web over your mobile data connection. There may be an extra charge for this.

Choosing a ...

Digital camera

01 A basic digital camera will suit someone who wants to take pictures to view on their computer and create 7x5in prints. It should cost around £80, but there may be hidden downsides such as slow performance and very basic user controls.

02 Spend a little more and you'll get a higher resolution. A 16-megapixel sensor has the potential to produce sharp prints up to A3 size, but only if it and the lens are of a suitably high quality. Very high resolutions in compact cameras tend to boost noise more than detail levels, so many of the best models strike a sensible balance by using a 12-megapixel sensor.

Back-illuminated CMOS sensors tend to produce less noise than CCDs, but check our reviews to find out how a particular model performs.

03 A 3x zoom lens gives you reasonable scope for framing your shots, but a larger range can do wonders for your photography. Most compact cameras can manage a 5x zoom, while pocket-size ultra-zoom cameras can provide 24x zoom ranges.

Numbers such as 28-105mm tell you the wide-angle and telephoto limits of the zoom range. Big zooms require optical image stabilisation to avoid blur due to camera shake when zoomed right in.

04 Most cameras now have a 3in screen. Look out for 460,000-dot or 921,000-dot resolutions for a sharper picture. A touchscreen is useful for moving the autofocus point.

05 Leave some room in your budget for a memory card, as the bundled memory is never enough. A 16GB card costs less than £10. You may also need to buy batteries.

06 Don't forget that a camera's specification tells you little about its image quality. You'll need to read our reviews for that. With a compact camera, we believe the user shouldn't have to grapple with complicated controls in order to take great pictures in a range of lighting conditions.

PHOTOGRAPHY

COMPACT SYSTEM CAMERA

COMPUTER SHOPPER BEST BUY

PANASONIC Lumix DMC-G7 ★★★★★

£539 inc VAT (£339 with cashback offer) • www.jessops.com

With sophisticated autofocus, superb controls and 4K video capture, the Panasonic G7 packs a serious punch for both video and stills photography.

SENSOR RESOLUTION 16 megapixels • **SENSOR SIZE** 17.3x13mm • **FOCAL LENGTH MULTIPLIER** 2x • **VIEWFINDER** Electronic (2,360,000 dots) • **LCD SCREEN** 3in (1,040,000 dots) • **OPTICAL ZOOM (35mm-EQUIVALENT FOCAL LENGTHS)** 3x (28-84mm) • **35mm-EQUIVALENT APERTURE** f/7-11.2 • **LENS MOUNT** Micro Four Thirds • **WEIGHT** 525g • **DIMENSIONS** 87x135x108mm • **WARRANTY** One year RTB • **DETAILS** www.panasonic.com/uk • **FULL REVIEW** Nov 2015

COMPACT CAMERA

COMPUTER SHOPPER BEST BUY

NIKON Coolpix S9700 ★★★★★

£160 inc VAT • www.buyacamera.co.uk

This compact camera packs in a 30x zoom lens, Wi-Fi, GPS and slow-motion video. Its has a comprehensive set of controls, but it's the image quality that really impresses, achieving decent shots in tough conditions.

SENSOR RESOLUTION 16 megapixels • **SENSOR SIZE** 1/2.3in • **VIEWFINDER** None • **LCD SCREEN** 3in (921,000 dots) • **OPTICAL ZOOM (35mm-EQUIVALENT FOCAL LENGTHS)** 30x (25-750mm) • **35mm-EQUIVALENT APERTURE** f/21-36 • **WEIGHT** 235g • **DIMENSIONS** 66x110x34mm • **WARRANTY** Two years RTB • **DETAILS** www.nikon.co.uk • **FULL REVIEW** Nov 2014

ULTRA-ZOOM CAMERA

COMPUTER SHOPPER BEST BUY

PANASONIC Lumix DMC-FZ200 ★★★★★

£298 inc VAT (£268 with cashback offer) • www.johnlewis.com

This ultra-zoom camera has a big 25-600mm zoom range and maintains a fast F2.8 aperture across the whole focal range, so you can shoot in low-light conditions without too much worry.

SENSOR RESOLUTION 12.1 megapixels • **SENSOR SIZE** 6.2x4.6mm (1/2.3in) • **VIEWFINDER** Electronic • **LCD SCREEN** 3in • **OPTICAL ZOOM (35mm-EQUIVALENT FOCAL LENGTHS)** 24x (25-600mm) • **35mm-EQUIVALENT APERTURE** f/15.5 • **WEIGHT** 588g • **DIMENSIONS** 87x125x110mm • **WARRANTY** One year RTB • **DETAILS** www.panasonic.com/uk • **FULL REVIEW** Feb 2013

CONSUMER SLR

COMPUTER SHOPPER BEST BUY

CANON EOS 750D ★★★★★

£540 inc VAT (£490 with cashback offer, includes 18-55mm kit lens) • www.jessops.com

This is the new mainstay of Canon's SLR line-up. With better autofocus, D5500-beating image quality and decent video, it's the mid-range SLR to buy. It's also available with extra manual controls as the 760D.

SENSOR RESOLUTION 24 megapixels • **SENSOR SIZE** 22.3x14.9mm (APS-C) • **FOCAL LENGTH MULTIPLIER** 1.6x **VIEWFINDER** Optical • **LCD SCREEN** 3in • **OPTICAL ZOOM (35mm-EQUIVALENT FOCAL LENGTHS)** 3x (29-88mm) • **35mm-EQUIVALENT APERTURE** f/5.6-9 • **LENS MOUNT** Canon EF-S • **WEIGHT** 771g • **DIMENSIONS** 104x132x148mm • **WARRANTY** One year RTB • **DETAILS** www.canon.co.uk • **FULL REVIEW** Oct 2015

COMPACT CAMERA

COMPUTER SHOPPER BEST BUY

CANON PowerShot G7 X ★★★★★

£379 inc VAT • www.wexphotographic.com

With near SLR-quality stills in a truly pocketable package, the PowerShot G7 X is a huge step up from most other compact cameras – and at an excellent price.

SENSOR RESOLUTION 20 megapixels • **SENSOR SIZE** 1in • **VIEWFINDER** None • **LCD SCREEN** 3in (1,040,000 dots) • **OPTICAL ZOOM (35mm-EQUIVALENT FOCAL LENGTHS)** 4.2x (24-100mm) • **35mm-EQUIVALENT APERTURE** f/4.9-7.6 • **WEIGHT** 301g • **DIMENSIONS** 64x107x40mm • **WARRANTY** One year RTB • **DETAILS** www.canon.co.uk • **FULL REVIEW** May 2015

DISPLAYS

MONITOR

COMPUTER SHOPPER BEST BUY

BENQ GW2765HT ★★★★★

£279 inc VAT • www.ballicom.co.uk

This 27in 2,560x1,440 IPS monitor is one of the best-value screens we've ever seen. With near-perfect sRGB colour accuracy out of the box, it's a steal for less than £300.

SCREEN SIZE 27in • **RESOLUTION** 2,560x1,440 • **SCREEN TECHNOLOGY** IPS • **VIDEO INPUTS** VGA, DVI, HDMI, DisplayPort • **WARRANTY** Two years onsite • **PART CODE** 9H.LCELA.TBE • **DETAILS** www.benq.co.uk • **FULL REVIEW** Jan 2015

MONITOR

COMPUTER SHOPPER RECOMMENDED

VIEWSONIC VX2363Smhl-W ★★★★☆

£129 inc VAT • www.dabs.com

The 23in VX2363Smhl-W stands out from the crowd with its white stand, IPS screen and great overall image quality. It's a good budget buy for those who have modest needs.

SCREEN SIZE 23in • **RESOLUTION** 1,920x1,080 • **SCREEN TECHNOLOGY** IPS • **VIDEO INPUTS** VGA, 1x HDMI, 1x MHL-compatible HDMI • **WARRANTY** Two years collect and return • **PART CODE** VX2363Smhl-W • **DETAILS** www.viewsoniceurope.com • **FULL REVIEW** Jan 2015

MONITOR

COMPUTER SHOPPER BEST BUY

IIYAMA ProLite GB2488HSU-B1 ★★★★★

£200 inc VAT • www.box.co.uk

Gamers need look no further than the Iiyama ProLite GB2488HSU-B1. It's a no-nonsense Full HD panel with a 144Hz refresh rate for lightning-fast games performance.

SCREEN SIZE 24in • **RESOLUTION** 1,920x1,080 • **SCREEN TECHNOLOGY** TN • **VIDEO INPUTS** 2x HDMI, DVI, DisplayPort • **WARRANTY** Two years onsite • **PART CODE** ProLite GB2488HSU-B1 • **DETAILS** www.iiyama.com • **FULL REVIEW** Aug 2014

MONITOR

COMPUTER SHOPPER BEST BUY

ASUS PB279Q ★★★★★

£575 inc VAT • www.debenhamsplus.com

If you're remotely serious about design, photography or gaming and want an Ultra HD screen, this is the monitor to choose. It's plain to look at and has no USB hub, but in terms of pure image quality, nothing beats it at this price.

SCREEN SIZE 27in • **RESOLUTION** 3,840x2,160 • **SCREEN TECHNOLOGY** AHVA • **REFRESH RATE** 60Hz • **VIDEO INPUTS** 4x HDMI, DisplayPort, Mini DisplayPort • **WARRANTY** Three years RTB • **DETAILS** www.asus.com • **FULL REVIEW** Apr 2015

MONITOR

COMPUTER SHOPPER BEST BUY

SAMSUNG S32D850T ★★★★★

£400 inc VAT • www.laptopsdirect.co.uk

It's not cheap, but this 32in monitor is great value. Images are sharp and vibrant on its 2,560x1,440 panel, and the stand is among the most attractive we've seen.

SCREEN SIZE 32in • **RESOLUTION** 2,560x1,440 • **SCREEN TECHNOLOGY** VA • **VIDEO INPUTS** HDMI, DVI, DisplayPort • **WARRANTY** Two years collect and return • **PART CODE** S32D850T • **DETAILS** www.samsung.com/uk • **FULL REVIEW** Jan 2015

COMPUTER SHOPPER
RECOMMENDED

PHILIPS 55PFT6510/12
★★★★☆

£799 inc VAT • www.argos.co.uk

This Full HD TV uses the rapidly improving Android TV operating system. Its default image quality settings aren't great, but after a little tweaking this TV rewards you handsomely.

SCREEN SIZE 55in • **NATIVE RESOLUTION** 1,920x1,080 • **VIDEO INPUTS** 4x HDMI, SCART, Component • **TUNER** Freeview HD • **DIMENSIONS** 726x1,239x279mm • **WARRANTY** Two years RTB • **DETAILS** www.philips.co.uk • **PART CODE** 55PFT6510/12 • **FULL REVIEW** Dec 2015

SMART TV

COMPUTER SHOPPER
RECOMMENDED

SAMSUNG UE32J6300
★★★★★

£335 inc VAT • www.debenhamsplus.com

It might look expensive for the screen size, but the UE32J6300 is jam-packed with features, including one of the best smart TV systems around and every major UK catch-up TV service. It's the ideal small TV for a bedroom, kitchen or office.

SCREEN SIZE 32in • **NATIVE RESOLUTION** 1,920x1,080 • **VIDEO INPUTS** 4x HDMI, component, composite • **TUNER** Freeview HD • **DIMENSIONS** 428x370x91mm • **WARRANTY** One year RTB • **DETAILS** www.samsung.com/uk • **PART CODE** UE32J6300AK • **FULL REVIEW** Dec 2015

SMART TV

COMPUTER SHOPPER
RECOMMENDED

SAMSUNG BD-J7500
★★★★★

£140 inc VAT • www.johnlewis.com

4K upscaling, fantastic image quality and a wealth of streaming service support makes the BD-J7500 so much more than just a Blu-ray player.

BLU-RAY PROFILE 5.0 • **3D CAPABLE** Yes • **DIMENSIONS** 360x224x39mm • **NETWORKING** Ethernet, 802.11ac Wi-Fi • **WARRANTY** One year RTB • **DETAILS** www.samsung.com/uk • **PART CODE** BD-J7500 • **FULL REVIEW** Nov 2015

BLU-RAY PLAYER

COMPUTER SHOPPER
RECOMMENDED

LG LHB725
★★★★☆

£399 inc VAT • www.ao.com

A 3D-capable home cinema surround system with a Blu-ray player that has fantastic image quality and speakers that deliver powerful sound, all housed in an attractive package.

HDMI INPUTS/OUTPUTS 2/1 • **HDMI 2.0 INPUTS/OUTPUTS** 2/1 • **OUTPUT RESOLUTIONS** 720p, 1080p • **WIRELESS SUPPORT** 802.11n, Bluetooth • **SPEAKER CONFIGURATION** 5.1 • **RMS POWER OUTPUT TOTAL** 1,200W • **DIMENSIONS** 410x55x260mm • **WARRANTY** One year RTB • **DETAILS** www.lg.com/uk • **PART CODE** LHB725 • **FULL REVIEW** Oct 2015

HOME CINEMA SYSTEM

COMPUTER SHOPPER
RECOMMENDED

SAMSUNG HW-J7500
★★★★★

£495 inc VAT • www.hillsradio.co.uk

This curved 8.1 soundbar with wireless subwoofer not only looks great, but also produces excellent sound and has plenty of ports.

SPEAKERS 8 • **RMS POWER OUTPUT** 320W • **DOCK CONNECTOR** None • **NETWORKING** Bluetooth 3.0 • **DIMENSIONS** 1,230x170x42mm (soundbar), 291x371x291mm (subwoofer) • **WEIGHT** 4kg (soundbar), 7.8kg (subwoofer) • **WARRANTY** One year RTB • **DETAILS** www.samsung.com/uk • **PART CODE** HW-J7500 • **FULL REVIEW** Jul 2015

SOUNDBAR/SUBWOOFER

COMPUTER SHOPPER
BEST BUY

PHILIPS Fidelio M2BT
★★★★★

£200 inc VAT • www.currys.co.uk

The Philips Fidelio M2BT is a premium set of Bluetooth headphones that sounds great, looks fantastic and is supremely comfortable to wear.

HEADPHONES TYPE On-ear Bluetooth • **PLUG TYPE** 3.5mm jack plug • **WEIGHT** 190g • **CABLE LENGTH** 1.2m • **WARRANTY** One year RTB • **DETAILS** www.philips.co.uk • **PART CODE** M2BTBK/00 • **FULL REVIEW** Apr 2015

ON-EAR HEADPHONES

COMPUTER SHOPPER
RECOMMENDED

RAUMFELD One S
★★★★★

£200 inc VAT • www.raumfeld.com/uk

The One S is an excellent compact speaker that sounds great on its own or even better as a stereo pair, and has a classy design that matches its refined sound.

SPEAKERS 4 • **RMS POWER OUTPUT** 30W • **DOCK CONNECTOR** None • **NETWORKING** 802.11n Wi-Fi • **DIMENSIONS** 180x110x130mm • **WEIGHT** 1.4kg • **STREAMING FORMATS** UPnP, Mesh Network • **WARRANTY** One year RTB • **DETAILS** www.raumfeld.com/uk • **PART CODE** One S • **FULL REVIEW** Nov 2015

MULTIROOM SPEAKER

COMPUTER SHOPPER
RECOMMENDED

RAZER Leviathan
★★★★☆

£170 inc VAT • www.pcworld.co.uk

Soundbars are usually built for TVs, but Razer's Leviathan is ideal for sliding under a computer monitor. It sounds great and is more than loud enough to fill a room.

SPEAKERS 4 • **RMS POWER OUTPUT** 30W • **WEIGHT** 2kg (bar), 2.3kg (subwoofer) • **NETWORKING** Bluetooth (SBC, aptX) • **WARRANTY** Two years RTB • **DETAILS** www.razerzone.com • **PART CODE** RZ05-01260100-R3G1 • **FULL REVIEW** Jul 2015

PC GAMING SOUNDBAR

COMPUTER SHOPPER
RECOMMENDED

LOGITECH UE Megaboom
★★★★☆

£230 inc VAT • www.ballicom.co.uk

The UE Megaboom is an intensely loud and powerful Bluetooth speaker that provides a warm and impactful sound. It's waterproof, too, so could provide some entertainment poolside or at your next barbecue.

SPEAKERS 4 • **RMS POWER OUTPUT** Not disclosed • **DOCK CONNECTOR** None • **WIRELESS** Bluetooth (SBC) • **DIMENSIONS** 83x83x226mm • **WEIGHT** 877g • **WARRANTY** Two years RTB • **DETAILS** www.ultimateears.com • **PART CODE** 984-000438 • **FULL REVIEW** Aug 2015

BLUETOOTH SPEAKER

COMPUTER SHOPPER
RECOMMENDED

ARCAM miniBlink
★★★★★

£100 inc VAT • www.petertyson.co.uk

Stream music from your mobile phone or tablet to your hi-fi with the petite and attractive miniBlink. This high-quality Bluetooth receiver sounds good and is delightfully simple to use.

WARRANTY Two years RTB • **PART CODE** miniBlink • **DETAILS** www.arcam.co.uk • **FULL REVIEW** Aug 2014

AUDIO INTERFACE

Choosing a ...

Bluetooth speaker

01 Bluetooth speakers come in all shapes and sizes, so it's worth deciding what you want to do with it before you buy. If you don't plan to take your music outdoors or around the house, look for a wired speaker. These are typically cheaper than speakers with built-in batteries. If you do want a portable speaker, however, pay particular attention to how much it weighs. Ruggedised models should be able to survive accidental drops, water spills and unexpected rain showers.

02 Many of the cheapest Bluetooth speakers use the lossy A2DP Bluetooth protocol, which is prone to compressing your music and discarding detail compared with the original recording. It's hard to tell the difference when listening to pocket sized speakers, but if you're looking for a speaker to fill a room, an aptX-compatible device is a better option. This Bluetooth protocol retains more detail than A2DP, although you'll need to use it with a compatible smartphone to get the benefits.

03 As with any audio product, the number and size of speaker drivers can have a significant impact on the quality of sound you get from a Bluetooth speaker. Typically, the presence of multiple drivers enables the manufacturer to tune each one for specific frequencies, directing high-end sounds towards a tweeter and sending the mid-range frequencies to the main driver. Single-driver speakers with larger driver cones can be just as capable of producing fantastic audio, however.

04 Most Bluetooth speakers have at least one auxiliary input for a wired 3.5mm audio jack, in case you want to listen to music from a device that doesn't have Bluetooth. There are other extra features to look out for, though. Speakers with built-in batteries may have a USB port for charging your smartphone, or a built-in microphone to turn it into a speakerphone when a paired smartphone receives a call. Not all speakers have physical controls – many rely on your paired device's controls for adjusting the volume or muting playback.

Choosing a ...

Laser printer

01 Laser printers used to be much more expensive than inkjets and were typically restricted to offices. They are now much more affordable, however, and offer several benefits over inkjets, including lower per-page printing costs and faster print speeds.

02 A decent laser printer will typically cost around £80, and will happily print hundreds of black and white pages per hour. If documents are your priority, you'll want a high minimum speed and low print costs. However, you'll probably be limited to black-and-white printing at this price.

03 Although you can still buy single-function laser printers, multifunction printers (MFPs) are now far more common. They can scan documents as well as print, and some of them also have fax capabilities. Laser MFPs start from around £200.

04 Heavy-duty office lasers can cost thousands of pounds. They use large individual toner drums, which can cut running costs. Automatic duplex (double-sided) printing is also common here.

05 Although laser printers are more suited to text than graphics, many are still able to produce high-quality photos. Speed isn't a priority here – instead choose a printer that reproduces subtle tones well. You can't determine this by looking at the specifications; only hands-on testing will do, so remember to check our reviews before you buy. Borderless printing (up to the edge of the paper) should also be possible.

06 If you want to print from multiple devices, make sure you look for extended connectivity. Decent laser printers can be shared on your local network and have USB ports for direct printing, memory card slots for printing images from a digital camera, and iOS, Android or Google Cloud Print support for printing from mobile devices such as smartphones or tablets. An LCD preview screen offers greater control for this method of printing.

STORAGE

SSD

COMPUTER SHOPPER RECOMMENDED
SAMSUNG 850 Evo 500GB
★★★★★

£115 VAT • www.amazon.co.uk

Samsung's 850 Evo is simply the fastest SATA SSD around, and it's available in a wide range of capacities. The 500GB model is fantastic value for money.

CAPACITY 500GB • **COST PER GIGABYTE** £0.23 • **INTERFACE** SATA3 • **CLAIMED READ** 540MB/s • **CLAIMED WRITE** 520MB/s • **WARRANTY** Five years RTB • **DETAILS** www.samsung.com/uk • **PART CODE** MZ-75E500BW/EU • **FULL REVIEW** Oct 2015

HARD DISK

COMPUTER SHOPPER BEST BUY
WESTERN DIGITAL Red 6TB
★★★★★

£182 inc VAT • www.cclonline.com

The Red 6TB combines excellent performance with a high capacity and special firmware, making a hard disk that's perfect for use in NAS enclosures.

CAPACITY 6TB • **COST PER GIGABYTE** £0.03 • **INTERFACE** SATA3 • **WARRANTY** Three years RTB • **PART CODE** WD60EFRX • **DETAILS** www.wdc.com • **FULL REVIEW** Nov 2014

NAS

COMPUTER SHOPPER BEST BUY
SYNOLOGY DiskStation DS215j
★★★★★

£135 inc VAT • www.ebuyer.com

Synology's latest NAS is faster than its predecessor thanks to an upgraded CPU, and is capable of rapid file transfers. DSM is still the best NAS operating system we've used, too.

3¹/₂in HARD DISK BAYS (FREE) 2 (2) • **NETWORKING** 2x 10/100/1,000 Ethernet • **WARRANTY** Two years RTB • **PART CODE** DS215J • **DETAILS** www.synology.com • **FULL REVIEW** Jun 2015

PORTABLE SSD

COMPUTER SHOPPER BEST BUY
SAMSUNG T1 500GB
★★★★★

£167 inc VAT • www.ebuyer.com

The T1 has its own SSD controller, making it significantly faster than any USB3 flash drive. It's able to transfer files at unbelievable speeds – then slip into a pocket for taking on the move.

CAPACITY 500GB • **COST PER GIGABYTE** £0.33 • **INTERFACE** USB3 • **CLAIMED READ** 450MB/s • **CLAIMED WRITE** 450MB/s • **WARRANTY** Three years RTB • **PART CODE** MU-PS500B/EU • **DETAILS** www.samsung.com/uk • **FULL REVIEW** Apr 2015

PORTABLE HARD DISK

COMPUTER SHOPPER BEST BUY
TOSHIBA Canvio Connect II 2TB
★★★★★

£73 inc VAT • www.ebuyer.com

This portable disk has an excellent bundled software package and impressive USB3 speeds. Considering the price, there's no reason not to buy one.

CAPACITY 2TB • **COST PER GIGABYTE** £0.04p • **INTERFACE** USB3 • **WARRANTY** One year RTB • **PART CODE** HDTC820ER3CA • **DETAILS** www.toshiba.eu • **FULL REVIEW** Nov 2015

PRINTERS AND SCANNERS

MONO LED PRINTER

COMPUTER SHOPPER BUSINESS BUY
RICOH SP 3600DN
★★★★★

£160 inc VAT • www.ebuyer.com

The SP 3600DN can print up to 50,000 pages per month at 30ppm. The quality is good, and each page costs only about 1.2p. It's a good choice for a busy small firm.

TECHNOLOGY Mono LED • **MAXIMUM PRINT RESOLUTION** 1,200x1,200dpi • **DIMENSIONS** 268x370x392mm • **WEIGHT** 14.5kg • **MAXIMUM PAPER SIZE** A4/legal • **WARRANTY** Two years RTB • **DETAILS** www.ricoh.co.uk • **PART CODE** 906231 • **FULL REVIEW** Oct 2015

COLOUR LASER PRINTER

COMPUTER SHOPPER BEST BUY
CANON i-SENSYS LBP7780Cx
★★★★★

£410 inc VAT • www.lambda-tek.com

It's somewhat expensive to buy, but the Canon i-SENSYS LBP7780Cx is very cheap to run and produces impressively high-quality prints.

TECHNOLOGY Single-pass colour laser • **MAXIMUM PRINT RESOLUTION** 600x600dpi • **DIMENSIONS** 401x517x530mm • **WEIGHT** 31kg • **MAXIMUM PAPER SIZE** A4/legal • **WARRANTY** One year onsite • **DETAILS** www.canon.co.uk • **PART CODE** 6140B010AA • **FULL REVIEW** Mar 2015

INKJET MFP

COMPUTER SHOPPER BEST BUY
EPSON Expression Photo XP-760
★★★★★

£125 inc VAT • www.box.co.uk

It's not brilliant for printing office documents, but if you want great photos and fantastic scanning, Epson's good-looking and compact XP-760 is perfect.

TECHNOLOGY Piezo inkjet • **MAXIMUM PRINT RESOLUTION** 5,760x1,440dpi • **MAXIMUM OPTICAL SCAN RESOLUTION (OUTPUT BIT DEPTH)** 2,400x4,800dpi (48-bit) • **DIMENSIONS** 141x390x341mm • **WEIGHT** 6.9kg • **MAXIMUM PAPER SIZE** A4/legal • **WARRANTY** One year RTB • **DETAILS** www.epson.co.uk • **PART CODE** C11CD96401 • **FULL REVIEW** Mar 2015

INKJET MFP

COMPUTER SHOPPER BEST BUY
CANON Pixma MG6650
★★★★★

£78 inc VAT • www.currys.co.uk

This well-specified MFP isn't the fastest, but its print, copy and scan quality are superb. Improved touchscreen controls make it easier to use than some Pixmas, and its ink costs are reasonable too.

TECHNOLOGY Thermal inkjet • **MAXIMUM PRINT RESOLUTION** 4,800x1,200dpi • **SCANNER RESOLUTION** 1,200x2,400dpi • **DIMENSIONS** 148x455x369mm • **WEIGHT** 6.4kg • **MAXIMUM PAPER SIZE** A4/legal • **WARRANTY** One year RTB • **DETAILS** www.canon.co.uk • **PART CODE** 9539B008AA • **FULL REVIEW** Aug 2015

OFFICE PRINTER

COMPUTER SHOPPER BEST BUY
HP Officejet Pro X476dw
★★★★★

£323 inc VAT • www.ebuyer.com

It may be an inkjet-based device, but HP's MFP beats most colour lasers for speed, print quality and running costs.

TECHNOLOGY Thermal inkjet • **MAXIMUM PRINT RESOLUTION** 2,400x1,200dpi • **SCANNER RESOLUTION** 1,200x1,200dpi • **DIMENSIONS** 517x517x399mm • **WEIGHT** 24kg • **MAXIMUM PAPER SIZE** A4/legal • **WARRANTY** One year onsite • **DETAILS** www.hp.co.uk • **PART CODE** CN461A • **FULL REVIEW** Mar 2015

NETWORKS

COMPUTER SHOPPER — BEST BUY
TP-LINK Archer C9
★★★★★

£90 inc VAT • www.currys.co.uk

It doesn't have a modem, so you'll need to pair it with your ISP's cable, ADSL or fibre modem, but the Archer C9 is an incredibly capable router with plenty of features and fantastic wireless performance.

WI-FI STANDARD 802.11ac • **STATED SPEED** 1,900Mbit/s • **USB PORTS** 1x USB3, 1x USB2 • **LAN PORTS** 4x Gigabit • **WALL MOUNTABLE** No • **WARRANTY** Three years RTB • **PART CODE** Archer C9 • **DETAILS** uk.tp-link.com • **FULL REVIEW** Sep 2015

COMPUTER SHOPPER — RECOMMENDED
BT Dual-Band Wi-Fi Extender 1200
★★★★★

£40 inc VAT • www.currys.co.uk

This fast wireless extender is easy to set up and is the perfect companion to an 802.11ac router. The wired LAN port lets you connect a wired device to your wireless network, too.

WI-FI STANDARD 802.11ac • **STATED SPEED** 867Mbit/s • **LAN PORTS** 1x 10/100 • **WARRANTY** Three years RTB • **PART CODE** 80462 • **DETAILS** connectedhome.bt.com • **FULL REVIEW** Aug 2015

COMPUTER SHOPPER — RECOMMENDED
DEVOLO dLAN 1200+ Starter Kit
★★★★★

£110 inc VAT • www.scan.co.uk

Devolo's dLAN 1200+ is the fastest Powerline networking kit we've seen, even if you're limited to a single Gigabit Ethernet connection. The passthrough sockets are very convenient, too.

POWERLINE NETWORKING STANDARD HomePlug AV2 • **STATED SPEED** 1,200Mbit/s • **ADAPTORS IN BOX** 2 • **WARRANTY** Three years RTB • **PART CODE** 09378 • **DETAILS** www.devolo.com/uk • **FULL REVIEW** Feb 2015

COMPUTER SHOPPER — RECOMMENDED
ASUS EA-AC87
★★★★☆

£118 inc VAT • www.box.co.uk

It's much larger than the average range extender, but that's only to make room for a whopping five Gigabit Ethernet ports. The EA-AC87 can also act as a Wi-Fi access point.

MODEM None • **WI-FI STANDARD** 802.11ac • **STATED SPEED** 1,734Mbit/s • **USB PORTS** 0 • **WALL MOUNTABLE** Yes • **LAN PORTS** 5x Gigabit • **WARRANTY** Two years RTB • **PART CODE** 90IG01A0-BU9000 • **DETAILS** www.asus.com • **FULL REVIEW** Sep 2015

D-LINK DSL-3590L
★★★★☆

£158 inc VAT • www.dabs.com

If you want to ditch your ISP-provided modem router, D-Link's DSL-3590L should be your first choice. It might not have the fastest Wi-Fi speeds but the feature list is impeccable.

MODEM ADSL2+ • **WI-FI STANDARD** 802.11ac • **STATED SPEED** 1,900Mbit/s • **USB PORTS** 1x USB3, 1x USB2 • **LAN PORTS** 4x Gigabit • **WALL MOUNTABLE** No • **WARRANTY** Two years RTB • **PART CODE** DSL-3590 • **DETAILS** www.dlink.com • **FULL REVIEW** Sep 2015

VIDEO

COMPUTER SHOPPER — RECOMMENDED
AMAZON Fire TV Stick
★★★★☆

£35 inc VAT • www.amazon.co.uk

This bargain media-streaming device excels for Amazon Prime subscribers. Even if you're not, you'll get good mileage out of it with platforms such as Plex. It's our favourite discrete streaming device.

VIDEO OUTPUTS HDMI 1.4 • **NETWORKING** 802.11n • **STREAMING FORMATS** UPnP, AirPlay, DLNA • **INTERNET STREAMING SERVICES** iPlayer, Netflix, Sky News, Spotify, TuneIn Radio, Amazon Instant Video, TVPlayer • **DIMENSIONS** 115x115x17mm • **WARRANTY** One year RTB • **PART CODE** Fire TV Stick • **DETAILS** www.amazon.co.uk • **FULL REVIEW** Aug 2015

COMPUTER SHOPPER — RECOMMENDED
GOPRO Hero4 Black
★★★★★

£329 inc VAT • www.argos.co.uk

The GoPro Hero4 Black doesn't deviate from the existing GoPro template but it's an excellent action camera that introduces stunning 4K video at 30fps. You also get support for a wide range of mounts and accessories, meaning you'll be able to capture fantastic footage whatever the activity.

SENSOR 1/2.3in CMOS • **SENSOR PIXELS** 12,000,000 • **MAX RECORDING RESOLUTION** 4K (30fps) • **AV CONNECTIONS** Micro HDMI output, 3.5mm microphone to Mini USB (optional) • **DIMENSIONS** 41x59x30mm • **WEIGHT** 89g (152g with housing) • **WARRANTY** One year RTB • **PART CODE** CHDHX-4-1-EU • **DETAILS** www.gopro.com • **FULL REVIEW** May 2015

COMPUTER SHOPPER — BEST BUY
HUMAX HDR-1100S 500GB
★★★★★

£190 inc VAT • www.johnlewis.com

The Humax HDR-1100S is an attractive Freesat+ PVR that's easy to use and integrates catch-up TV seamlessly through Freetime.

TUNERS 2x DVB-S2 Freesat • **DIMENSIONS** 280x48x200mm • **NETWORKING** Gigabit Ethernet, 802.11n Wi-Fi • **INTERNAL DISK CAPACITY** 500GB • **WARRANTY** One year RTB • **DETAILS** www.humaxdirect.co.uk • **PART CODE** HDR-1100S-White • **FULL REVIEW** Dec 2015

COMPUTER SHOPPER — RECOMMENDED
VEHO Muvi K2 NPNG
★★★★★

£202 inc VAT • www.amazon.co.uk

The K2 packs in plenty of action camera features for a budget price, and comes with a generous number of accessories, including a useful hard transport case. Image quality is very respectable too.

SENSOR PIXELS 16,000,000 • **MAX RECORDING RESOLUTION** 1080p (60fps) • **AV CONNECTIONS** Mini HDMI • **DIMENSIONS** 40x23x60mm • **WEIGHT** 84g • **WARRANTY** One year RTB • **DETAILS** www.veho-muvi.com • **PART CODE** K2NPNG **FULL REVIEW** Dec 2015

COMPUTER SHOPPER — RECOMMENDED
PANASONIC HC-WX970
★★★★★

£586 inc VAT • www.photospecialist.co.uk

This twin-camera 4K-capable camcorder lets you capture 8-megapixel stills from 4K video. It has superb image stabilisation and its HDR video mode can help with exposing difficult scenes.

OPTICAL ZOOM 20x • **SENSOR** 1/2.3in BSI MOS • **LCD SCREEN** 3in, 460,800 dots • **DIMENSIONS** 73x65x139mm • **WEIGHT** 360g • **WARRANTY** One year RTB • **DETAILS** www.panasonic.com • **PART CODE** HC-WX970 • **FULL REVIEW** Sep 2013

Choosing a ...
Wireless router

01 Wireless routers conform to a number of standards, so you shouldn't have any trouble connecting your computer or phone wirelessly if you get an 802.11n or 802.11ac router. Nearly all routers support 802.11n, so even a cheap model should provide decent performance.

You can expect a transfer speed of around 40Mbit/s at 10m from any modern 802.11n router. The very latest routers use the incredibly fast 802.11ac standard, which provides tremendously fast transfer speeds. Few devices support the 802.11ac standard at the moment, but this situation will change over the coming months.

02 If you subscribe to an ADSL broadband service, you should buy a wireless router that has a built-in ADSL modem. This will cost more than the equivalent cable router, but it allows you to connect your router directly to your broadband connection without having to use a separate modem.

03 Most 802.11n wireless routers use the 2.4GHz frequency band. This has good range but can be prone to interference if it's positioned close to a lot of other 2.4GHz devices, such as other routers and baby monitors. If you have trouble getting a consistent signal or you want faster speeds for video streaming, it's worth buying a dual-band router that can use both the 2.4GHz and 5GHz bands.

Alternatively, a high-gain antenna can boost signals and improve ranges and throughputs to the entire house. You can also add a high-gain antenna to a PC's network adaptor. If wired network speeds are a priority, look for a router with Gigabit Ethernet.

04 Many routers come with built-in USB ports that let you connect a USB drive and use the router as a network storage device. If you want to share a USB printer over your network, look for a wireless router that has a USB print server.

Finally, if you're interested in making voice calls over the internet, buy a router with built-in VoIP support (and phone sockets) because this can save you money.

Choosing a ...

Graphics card

01 You really don't have to spend much to buy a decent graphics card that can drive multiple monitors. The AMD Radeon R7 250 costs less than £60, for example, and while it isn't suited to playing the latest games in Full HD, it is perfect for watching videos, browsing the web and playing basic games.

02 You'll need to spend more money if you want to play the latest games. A good mid-range gaming graphics card is the Nvidia GTX 950, which is powerful enough to play any of the latest games.

High-powered cards tend to be more expensive, so expect to pay over £300 if you want to play games in Ultra HD at the highest quality settings.

03 Check that your chosen card has the graphics outputs you need. Only low-end cards now have VGA outputs, but many come with a DVI-to-VGA adaptor. Depending on your monitor, you may also want an HDMI output or even DisplayPort.

Bear in mind that AMD's Eyefinity triple-monitor gaming mode requires at least one DisplayPort monitor, which means your AMD graphics card must have at least one DisplayPort output. Nvidia's Surround three-monitor mode needs only DVI and HDMI ports.

04 The amount of memory a card has is important if you want games to look their best at high resolutions. Get a card with 2GB of RAM at the very least, as this should allow you to select the highest-quality textures in games.

05 A card's size, noise output and power requirements are the final considerations. Make sure your PC's case has enough room to accommodate your chosen card. Double-slot cards with large fans tend to be quieter than single-slot cards with small fans but will block other expansion slots on your motherboard.

Also check that your power supply can provide the power the card needs and that it has the right connectors. Many cards require a six-pin PCI Express power connector, and some also need an additional eight-pin connector.

COMPONENTS

GRAPHICS CARD

COMPUTER SHOPPER BEST BUY

EVGA GTX 950 2GB SSC
★★★★★

£140 inc VAT • www.ebuyer.com

Nvidia's latest mid-range champion can handle modern games at 1080p while staying cool and quiet into the bargain. It's great value.

GPU Nvidia GeForce GTX 950 • **MEMORY** 2GB GDDR5 • **GRAPHICS CARD LENGTH** 257mm • **WARRANTY** Three years RTB • **DETAILS** www.evga.com • **PART CODE** 02G-P4-2957-KR • **FULL REVIEW** Jan 2016

PROCESSOR

COMPUTER SHOPPER RECOMMENDED

INTEL Core i5-6600K
★★★★★

£225 inc VAT • www.novatech.co.uk

The Core i5-66000K is the first of Intel's latest processor generation. The unlocked multiplier means you can push it further when overclocking, and energy efficiency has never been better.

SOCKET LGA1151 • **CORES** 4 • **FREQUENCY** 3.5GHz • **INTEGRATED GRAPHICS** Intel HD Graphics 530 • **WARRANTY** One year RTB • **DETAILS** www.intel.com • **PART CODE** BX80662I56600K • **FULL REVIEW** Nov 2015

PROCESSOR

COMPUTER SHOPPER BEST BUY

AMD A10-7700K
★★★★★

£90 inc VAT • www.scan.co.uk

The A10-7700K strikes an excellent balance between desktop and graphics performance, making it the ideal all-rounder for an inexpensive PC build.

SOCKET FM2 • **CORES** 4 • **FREQUENCY** 3.4GHz • **INTEGRATED GRAPHICS** AMD Radeon R7 • **WARRANTY** One year RTB • **DETAILS** www.amd.com • **PART CODE** AD770KXBJABOX • **FULL REVIEW** May 2015

MOTHERBOARD

COMPUTER SHOPPER BEST BUY

ASUS Z170-A
★★★★★

£110 inc VAT • www.ebuyer.com

The Asus Z170-A is the best-value Skylake motherboard around right now, with performance and features that easily match those of more expensive boards without making a big dent in your wallet.

PROCESSOR SOCKET LGA1151 • **DIMENSIONS** 302x244 • **CHIPSET** Intel Z170 • **MEMORY SLOTS** 4 • **PCI-E X16 SLOTS** 3 • **PCI-E X1 SLOTS** 3 • **PCI SLOTS** 1 • **USB PORTS** 2x USB2, 2x USB3, 2x USB 3.1 • **VIDEO OUTPUTS** HDMI, DVI, VGA, DisplayPort • **WARRANTY** Three years RTB • **DETAILS** www.asus.com/uk • **PART CODE** Z170-A • **FULL REVIEW** Nov 2015

PC CASE

COMPUTER SHOPPER RECOMMENDED

SILVERSTONE Kublai KL05
★★★★☆

£45 inc VAT • www.scan.co.uk

With a serious amount of space for storage and cooling, SilverStone's latest Kublai mid-tower case is flexible enough to house almost any PC build.

CASE TYPE ATX mid-tower • **MOTHERBOARD COMPATIBILITY** ATX, microATX, Mini-ITX • **SUPPLIED FANS** 1x 120mm • **MAX 3$\frac{1}{2}$in DRIVE BAYS** 6 • **MAX 5$\frac{1}{4}$in DRIVE BAYS** 2 • **DIMENSIONS** 200x494x525mm • **WEIGHT** 6.9kg • **WARRANTY** One-year RTB • **DETAILS** www.silverstonetek.com • **PART CODE** SST-KL05B-W • **FULL REVIEW** Dec 2015

SOFTWARE

WEB DESIGN

COMPUTER SHOPPER BEST BUY

XARA Web Designer 11 Premium
★★★★★

£70 inc VAT • www.xara.com/uk

Web Designer was already excellent, but version 11 has received a slew of incremental updates that ensure it remains our favourite one-box web-design tool.

OS SUPPORT Windows XP or later • **MINIMUM CPU** Intel Celeron/AMD Sempron • **MINIMUM GPU** DirectX 9 • **MINIMUM RAM** 500MB • **HARD DISK SPACE** 300MB • **DETAILS** www.xara.com.uk • **FULL REVIEW** Sep 2015

VIDEO EDITING

COMPUTER SHOPPER BEST BUY

ADOBE Premiere Elements 14
★★★★★

£79 inc VAT • www.adobe.com/uk

Premiere Elements 14 has lots of features to keep advanced users happy and even more to help new users make the most of it. It's the consumer video-editing package to buy.

OS SUPPORT Windows 7/8/10 • **MINIMUM CPU** 2GHz with SSE2 • **MINIMUM GPU** DirectX 9 or 10 • **MINIMUM RAM** 2GB • **HARD DISK SPACE** 5GB • **DETAILS** www.adobe.com/uk • **PRODUCT CODE** 65234288 • **FULL REVIEW** Jan 2016

PHOTO EDITING

COMPUTER SHOPPER BEST BUY

ADOBE Photoshop Lightroom 6
★★★★★

£90 inc VAT • www.ebuyer.com

Lightroom 6 might be a relatively modest update, but Adobe's photography toolbox still sets the gold standard for Raw processing and image enhancement.

OS SUPPORT Windows 7/8 • **MINIMUM CPU** Intel or AMD with 64-bit support • **MINIMUM GPU** 1GB, OpenGL 3.3, DirectX 10 • **MINIMUM RAM** 2GB • **HARD DISK SPACE** 2GB • **DETAILS** www.adobe.com/uk • **PRODUCT CODE** 65237576 • **FULL REVIEW** Aug 2015

GRAPHIC DESIGN

COMPUTER SHOPPER BEST BUY

SERIF Affinity Designer
★★★★★

£40 inc VAT • Apple App Store

The first real competition to Adobe's Illustrator may be an OS X exclusive, but Affinity Designer is a seriously powerful graphic design tool that costs an incredibly reasonable £40.

OS SUPPORT Apple OS X 10.7.5 • **MINIMUM CPU** Core 2 Duo (64-bit) • **MINIMUM GPU** Intel HD Graphics • **MINIMUM RAM** 1GB • **HARD DISK SPACE** 325MB • **DETAILS** affinity.serif.com • **PRODUCT CODE** Affinity Designer • **FULL REVIEW** Mar 2015

MUSIC PRODUCTION

COMPUTER SHOPPER BEST BUY

STEINBERG Cubase Artist 8
★★★★★

£220 inc VAT • www.steinberg.net

Music production software usually saves the best features for the priciest version, but that's not the case here, making Cubase Artist 8 an excellent investment for musicians aspiring to the highest standards.

OS SUPPORT Windows 7 or later • **MINIMUM CPU** Intel Core/AMD dual-core • **MINIMUM GPU** DirectX 10 • **MINIMUM RAM** 4GB • **HARD DISK SPACE** 15GB • **DETAILS** www.steinberg.net • **PRODUCT CODE** 45550 • **FULL REVIEW** May 2015

Free software guide

It's easy to access your free software. Just go to *www.shopperdownload.co.uk/336* and register with the code from the card insert. Please be aware that you need to have bought the 'Free Software Edition' and not the '£4.50 Edition' to access the downloads
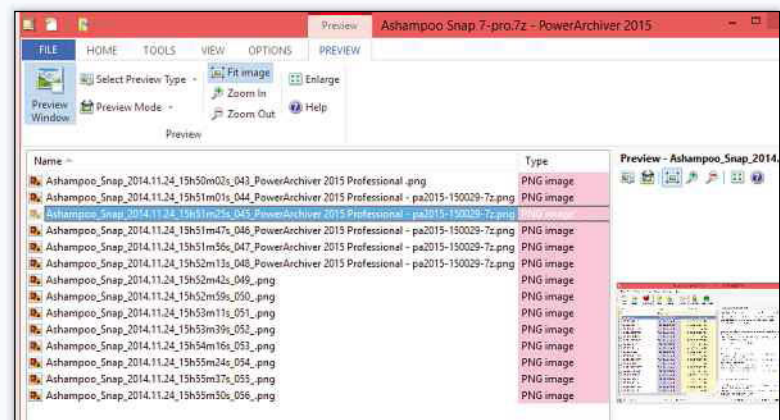
PowerArchiver 2015 Standard

POWERARCHIVER IS AN archiving tool that crams an array of powerful features into an easy-to-use interface.

It supports just about every file format, including ZIP, ZIPX, 7-ZIP, CAB, LHA (LZH), TAR, GZIP, BZIP2, ISO, BH, XXE, UUE, yENC, RAR, ARJ and MIME.

PowerArchiver offers exceptional security, too. As well as supporting the ZIP AES encryption standard (128-/192-/256-bit), its own PAE standard supports encryption with five different methods.

The program has plenty of practical benefits, too. It's extremely fast, and VSS and UAC elevation support mean it can cope with problems where other tools fail, compressing files even if they're in use and need administrator access to read. There are also tools to repair archives, convert them between formats, create self-extracting archives and a whole lot more.

REQUIREMENTS Windows XP, Vista, 7, 8, 10 32/64-bit, 10MB hard disk space
WEBSITE www.powerarchiver.com
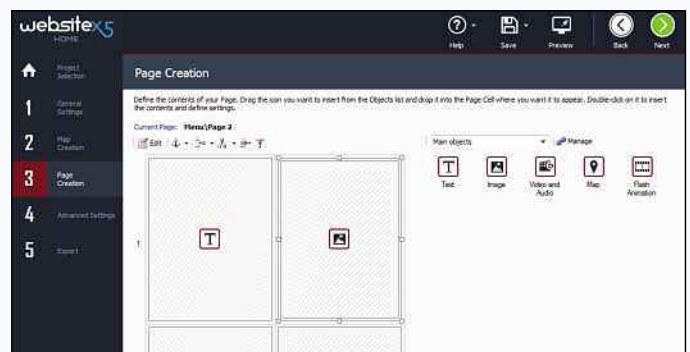**NOTES** Get your registration code at pa2015.disc.computershopper.co.uk

WebSite X5 12 Home

WEBSITE X5 IS a powerful application that makes it easy to create top-quality responsive websites, even if you've no design or coding experience.

To start, choose a template you like and then plan your site's structure using a map. From here, it's a case of populating each page in turn by dragging and cropping various elements onto your page. There are text blocks, images, galleries, tables, video and audio widgets, maps, Flash animations, product catalogues, email forms and more.
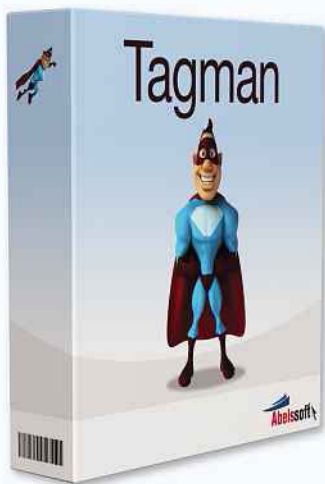
Each element can be styled in many ways. The program doesn't embed an image, for instance; you can define a quality setting, resize method, apply a host of smart mouseover effects (like zooming in and displaying custom text), and even use basic protection to prevent a browser copying the image.

While it's focused very much on ease of use, WebSite X5 also has plenty of more advanced options and settings. Templates can be edited or created from scratch, and there's support for Google Analytics, RSS feeds, data management schemes, access control and more.

REQUIREMENTS Windows XP, Vista, 7, 8, 10 32/64-bit, 300MB hard disk space
WEBSITE www.incomedia.eu
NOTES Get your registration code at www.websitex5.com/magazine/compshophome12uk

Tagman 2016

IF YOUR DIGITAL music collection is a mess, with missing tags and inconsistent filenames, it's harder to organise your MP3s and find what you need, yet the problem is so time-consuming to fix manually that you'll probably just decide to live with it.

There is another way, and it's called Tagman, a smart application that can automatically bring order to the most tangled of music collections. Just point the program at your MP3s, click 'Recognize…' and it goes to work, creating a digital fingerprint of each file and identifying it with the aid of a web database.

Tags will be set, cover art downloaded, and the results displayed for you to check. If you're happy, all the new data can be saved with a click.

There's an option to rename your files automatically, too. So no more 'track1.mp3', 'track2. mp3' and suchlike: just choose the filename pattern you prefer (Artist – Title, Track Number – Title, Title – Album and more),

and Tagman will rename all your selected MP3s to have the same naming structure.

Keep in mind that the fingerprinting and recognition process can take a while, and if you're scanning thousands of MP3s then you might have to wait a few hours for the process to finish.

Tagman does try to predict how much longer you'll have to wait, though, and if it's longer than expected you can simply click Cancel and try again with fewer folders.

REQUIREMENTS Windows XP, Vista, 7, 8, 10 32/64-bit, 50MB hard disk space
WEBSITE www.abelssoft.net
NOTES Get your registration code within the application. Note that if you've previously registered an Abelssoft full application, you won't need to register a second time
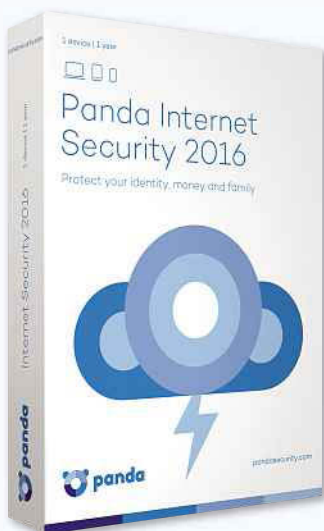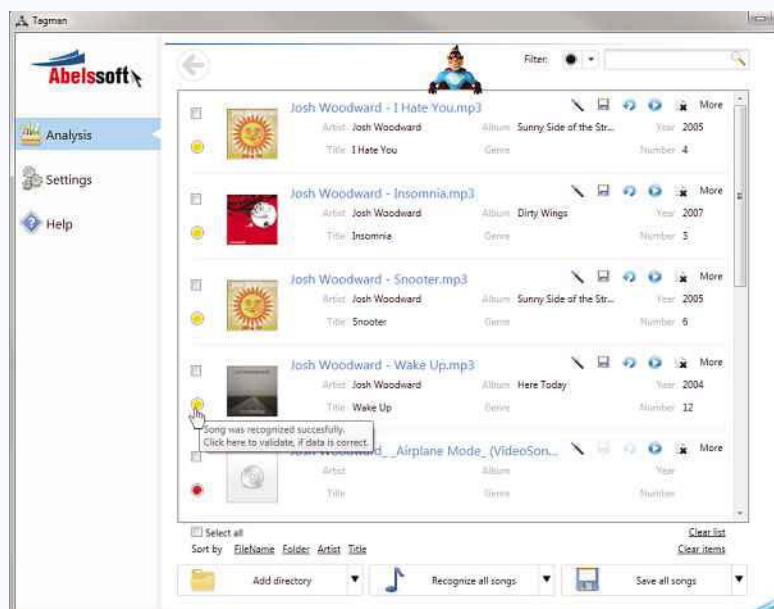
Panda Internet Security 2016

PANDA INTERNET SECURITY 2016 is a capable security suite with protection for Windows, Android, iOS and Mac.

The Windows module offers accurate antivirus, browser

protection (via an optional toolbar), a firewall and Wi-Fi protection to detect and block intruders. The Data Shield prevents sensitive information falling into the wrong hands,

parental controls keep your kids safe online, and there's a virtual keyboard to bypass keyloggers.

Mac and iOS protection is more about the basics, with anti-virus and an iPhone location service, while the Android tools take this further, with anti-virus, device optimisation, a location service, and the option to lock or wipe your device remotely.

All this is easy enough to set up, although look out for the option to install a browser toolbar; this will change your home and search pages unless you clear some tickboxes.

After that, the program proves as reliable and accurate as ever. The 2016 edition brings new checks for Wi-Fi vulnerabilities, a new engine and smarter Collective Intelligence, offering greater protection with less impact on performance.

REQUIREMENTS Windows XP, Vista, 7, 8 10 32/64-bit, 200MB hard disk space
WEBSITE www.pandasecurity.com
**NOTES** Six months' licence

Driver Booster 3 Pro

IOBIT'S DRIVER BOOSTER is a simple and straightforward tool which can scan your system for outdated drivers, then download and install replacements with a click. Upgrade to the Pro version and you gain additional features such as backup, faster download speeds and wider hardware support.

The program is unusually easy to use. There's no complex interface, no searching around trying to decide what you need to do: just launch Driver Booster, it immediately scans your PC, and a detailed report appears a few seconds later. You can then click the Update button for particular drivers: handy if you want to keep precise control over exactly what's going on.

Or if you're in a hurry, just click 'Update Now' and Driver
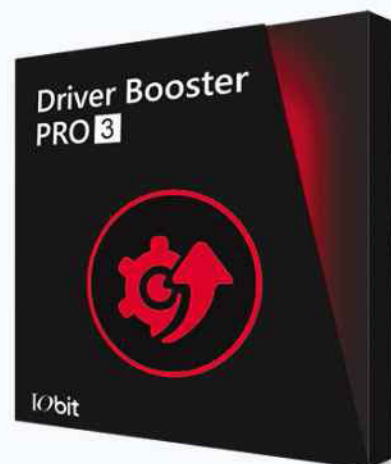
Booster will download and launch each update. Thanks to a silent update mechanism, you no longer have to manually wade through each and every driver update package, but do expect to reboot at the end of the process.

It's incredibly simple to use, but more experienced users will find plenty of tweakable options available should they need them.

Note that Driver Booster 3 Pro only works in 'Professional' mode after inserting your serial code.

REQUIREMENTS Windows XP, Vista, 7, 8, 10 32/64-bit, 50MB hard disk space
WEBSITE www.iobit.com
NOTES Get your registration code at db3.disc.computershopper.co.uk. Includes a six month licence

Zoner Photo Studio 17 Pro

ZONER PHOTO STUDIO 17 is a powerful tool for organising, browsing and editing photos.

The program opens with a well-designed thumbnail browser which makes it easy to find the images you need. Zoner Photo Studio can also import images from cameras or mobiles, acquire them from your scanner, extract the pictures from a PDF, find the JPEGs in almost any file type, or take images of your desktop with its built-in screen capture tool.

The editing tools are just as impressive. Choose to resize an image and you don't just get to enter the new dimensions; you can set the units (pixels, per cent, centimetres, millimetres or inches), pick one of nine resizing algorithms, decide to maintain the image's aspect ratio (or not), and apply a custom sharpness level to counter any blurring.

Then there's rotation. While other apps might be happy with simple 90° rotate and flip tools,

Zoner Photo Studio can also rotate to match an orientation or EXIF flag, or by some freehand amount, with your choice of rotation direction, background colour or even auto-cropping.

There are plenty of tools to adjust brightness, colours or sharpness, remove noise, fix assorted lens-related problems and generally get your photos looking their best. You might also use the bundled effects to give your images the look of an old photo, or even transform them into oil paintings or sketches.

Extras include watermarking tools, metadata editing, geotagging via Google Maps, batch processing, a duplicate file finder and panorama and HDR creators.

Once you've finished, there are tools to create slideshows, burn images to disc, build web galleries, send pictures via email, to FTP servers, or upload them to Picasa, Flickr or Facebook.

REQUIREMENTS Windows XP, Vista, 7, 8 or 10 32/64-bit, 200MB hard disk space
WEBSITE www.zoner.com
NOTES Get your registration code by registering within the application

COMPUTER SHOPPER Resources

Chat and Communication

Digsby (Build 92) Access all your instant messaging services from one application; there's support for Windows Live!, Yahoo!, AIM, Google Talk, ICQ and Jabber.

Evernote 5.9 Store your notes, ideas and plans in the cloud, and synchronise them between computers.

Mozilla Thunderbird 38.3 A powerful email client from the organisation best known for the Firefox web browser.

Postbox Express 1.0 An email client that provides a comprehensive array of tools to help you manage your messages more easily.

UPDATED Skype for Windows 7.14 Make internet voice and video calls for free, and buy credit to make calls to mobiles and landlines.

Trillian 5.6 Use all your instant messaging accounts with one application; this program has support for Windows Live!, AIM, Yahoo! and Google Talk.

Customisation

7 Taskbar Tweaker 5 Customise the Windows 7 taskbar so that it works exactly to your liking.

Metro UI Tweaker for Windows 8 Tweak the Windows 8 user interface.

Mosaic Desktop Beta 1 Refresh Add Windows 8's mosaic-tiled desktop to your computer without having to upgrade.

Rainmeter 3.2.1 Customise the desktop quickly and easily with your choice of information, tools and shortcuts.

Windows 8 Transformation Pack 9.1 Emulate the look of Windows 8 on an earlier version of the operating system.

Windows 10 Transformation Pack 5 Bring some of Windows 10's new features to your current operating system.

General

UPDATED Free Studio 6.5.9 This software provides an easy way to convert your video and audio files into different formats.

Paragon Partition Manager 14 Free Create, format, split, merge and reorganise all your hard disk's partitions.

PeaZip 5.8.1 A tremendously powerful archive-management tool.

UPDATED Screenshot Captor 4.15 Create and manage screenshots the easy way.

UPDATED SUMo 4.1.7 Quickly scan your PC's installed applications and find any updates that are available for them.

ZipGenius 6.3 A flexible file-compression tool with support for a huge number of compressed file formats.
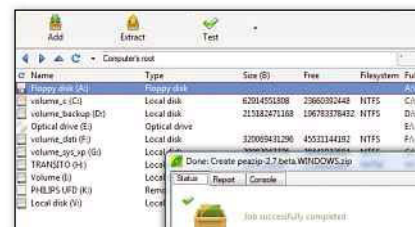
Internet and Network

CarotDAV 1.12 Manage all your online storage services with one simple application.

UPDATED Cyberduck 4.7.3 A powerful but easy-to-use FTP client for uploading and downloading your files.
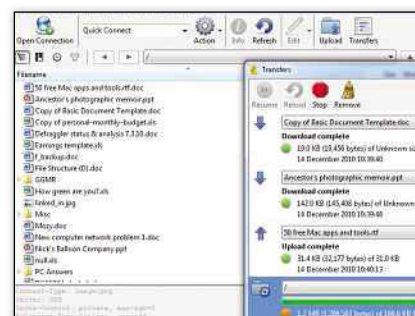
Easy WiFi 4.0 Find free Wi-Fi hotspots while you're out and about.

UPDATED NetBalancer 9.1.1 Make the most of your internet connection by assigning download and upload priorities to web applications.

TeamViewer 10.0 Remote-control your computer from anywhere in the world.

Vuze 5.6 A BitTorrent client to help you locate, share and download torrent files.

Tweaking and Performance

CCleaner 5.11 Remove unwanted information, temporary files, browsing history, huge log files and even the settings that uninstalled software leaves behind.

Defraggler 2.19 Ensure your system is defragmented properly and improve its performance.

Finestra Virtual Desktops 2.5 Set up four or more virtual desktops on your PC.

IObit Advanced SystemCare 8.4 A complete computer security, maintenance and optimisation suite.

Revo Uninstaller Free 1.95 Remove installed applications completely, including all their folders, system files and Registry entries.

Simple Performance Boost 1.0.5 Tweak the Windows Registry to give your PC a performance boost. ⬚

www.scan.co.uk

t: 01204 47 47 47

SCAN COMPUTERS
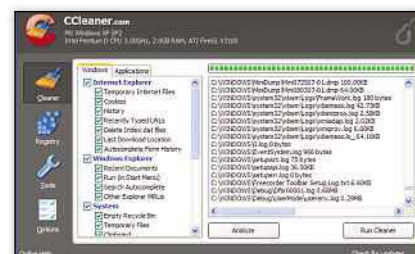
Crafting PCs the Scan way:
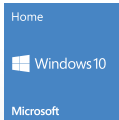## Specification. Service. Satisfaction.

Scan V1 Value System
Home / Office PC

- Intel® Pentium® G3240 processor
- 4GB Corsair DDR3 1333MHz memory
- 500GB SATA 6Gb/sec hard drive
- Windows 10

£310 Inc VAT

The V1 is a very capable entry-level system perfect from basic home/office tasks. It's based around the dual-core Intel® Pentium® G3240 processor, 4GB of RAM plus a 500GB hard disk.
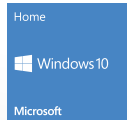
Home
Windows 10
Microsoft

Scan V15 Value System
Home / Office PC

- Intel® Core™ i5 4460 processor
- 8GB Corsair DDR3 1600MHz memory
- 1TB SATA 6Gb/sec hard drive
- Windows 10

£490 Inc VAT

The V15 ups the ante by including a quad-core Intel® Core™ i5 4460 processor, so it makes light work of office and multimedia applications.
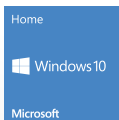
Home
Windows 10
Microsoft

Scan G20 Value System
Gaming PC

- Intel® Pentium® G3240 processor
- 8GB Corsair DDR3 1600MHz memory
- 2GB NVIDIA GeForce GTX 750 Ti SSC
- 1TB SATA 6Gb/sec hard drive
- Windows 10

£479 Inc VAT

Thanks to its dual-core Intel® Pentium® G3240 processor and NVIDIA GTX 750 Ti SSC graphics card the G20i is our most affordable gaming PC. It even includes surround sound!
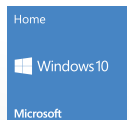
Home
Windows 10
Microsoft

Scan G30i Value System
Gaming PC

- Intel® Core™ i5 4460 processor
- 8GB Corsair DDR3 1600MHz memory
- 2GB NVIDIA GeForce GTX 960 SSC ACX
- 1TB SATA 6Gb/sec hard drive
- Windows 10

£659 Inc VAT

The combination of quad-core Intel® Core™ i5 4460 processor and NVIDIA GeForce GTX 960 SSC ACX graphics card ensures that the G30i can play any game you throw at it.

Home
Windows 10
Microsoft

Windows 10. Do great things.

Scan Value PCs
A range of computers perfectly suited for the home/office. These affordable PCs are very flexible workhorses, capable of every task, from email/web surfing to high-end applications such as photo editing, video encoding and gaming. All of our Value Systems are pre-built and soak-tested so are ready to ship for next-day delivery.

V Series

Finance Available on PCs above £300

Built by award winning 3XS team

Fully soak tested

Fully 3XS compatible

Ready to ship

2 Year Warranty Part + Labour

Some features require Windows 8.1. Update available through Windows Store. Internet access required; fees may apply. Some apps sold separately; vary by market. Prices correct at time of print and are subject to change.

# The most awarded PCs and Laptops Period.

Scan 3XS Gamer 20i Gaming PC

- Intel® Core™ i7 4790 processor
- 8GB Corsair DDR3 2133MHz memory
- 4GB NVIDIA GeForce GTX 970 SC ACX
- 1TB Seagate HDD
- Windows 10
- 3 Year Premium Warranty

£989 Inc VAT

The 3XS Gamer 20i is a super-fast gaming PC thanks to its combination of quad-core Intel Core i7 4790 CPU running at 3.6GHz with added Hyper-Threading plus a 4GB NVIDIA GeForce GTX 970 graphics card. These components are installed in an Asus Z97-K motherboard along with a 1TB hard disk.

Home
Windows 10
Microsoft
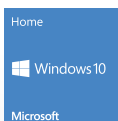
Scan 3XS Vengeance Gaming PC

- Intel® Core™ i7 6700K processor overclocked up to 4.7GHz
- 8GB Corsair DDR3 2133MHz memory
- 4GB NVIDIA GeForce GTX 980 SC
- 250GB Samsung 850 SSD & 2TB HDD
- Windows 10
- 3 Year Premium Warranty

£1479 Inc VAT

This high-end gaming system includes a Intel Core i7 6700K CPU which has Hyper-Threading and is overclocked up to 4.7GHz plus a 4GB NVIDIA GeForce GTX 980 graphics card, 8GB of 3000MHz Corsair Vengeance DDR4, an Asus Z170 Pro Gaming motherboard, 256GB SSD and a 2TB hard disk.

Home
Windows 10
Microsoft
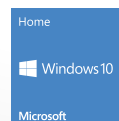
3XS LG15 Performance GTX

- Intel® Core™ i7 6700HQ processor
- 8GB Corsair DDR3 1600MHz memory
- 2GB NVIDIA GeForce GTX 960M
- 15.6in 1,920 x 1,080 screen
- 1TB SATA 6Gb/sec hard drive
- Windows 10

£859 Inc VAT

The LG15 Performance GTX is a 15.6" mid-range gaming laptop that includes a NVIDIA GeForce GTX 960M graphics card plus your choice of Intel Core i5 or i7 CPU, up to 16GB of RAM and multiple hard disks and SSDs.

Home
Windows 10
Microsoft
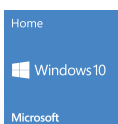
3XS LG15 Carbon G-Sync

- Intel® Core™ i7 6700 processor
- 8GB Corsair 2133MHz DDR4 memory
- 6GB NVIDIA GeForce GTX 970M or 980M
- 15.6in FullHD or 4K screen
- 1TB SATA 6Gb/sec hard drive
- Windows 10

£1389 Inc VAT

The LG15 Carbon G-Sync is a 15.6" high-end gaming laptop that includes a NVIDIA GeForce GTX 970M or 980M graphics card with your choice of Intel Core i5 or i7 CPU, up to 32GB of DDR4 and multiple hard disks and SSDs plus NVIDIA G-Sync for tearing and stutter free gaming.

Home
Windows 10
Microsoft
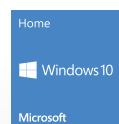
Scan Computers recommends Windows.

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Our 3XS Custom Series is a range of computers designed to offer the best performance for a variety of applications, with a particular focus on games. We build Custom Series PCs to order, so we can configure and tailor make an individual PC just the way you want it. We can also overclock the processor, so you get a faster PC without a substantial increase in price. All 3XS Custom Series PCs are covered by a three year warranty as standard with the first year on-site.

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3 YEARS STANDARD 3 Year Warranty

3XS SYSTEMS

BLOCK PARTY
Anti-virus suites tested

Is your PC well protected, or are you making it far too easy for hackers to crack open your system and scoop out your data? Find out with our detailed reviews of the latest security suites, all tested to destruction in *Shopper*'s state-of-the-art lab

CONTENT REVIEWS

LAST YEAR, WE suggested that anti-virus firms could very easily find themselves in the role of fear-mongers (see Group Test, *Shopper* 324). This year, we're left in no doubt that AV companies themselves are the ones who are terrified. We think it's because they've become too effective.

You only have to look at this year's results compared with those of 2014. Last year's highest Protection Score was 292 out of a possible 300, while the lowest was -70. Ignoring that anomaly, the lowest positive

Image Creative Commons (Alexx Sun)

score was 67. This year, the highest score is a perfect 300, while 223 is the lowest. Last year, a suite scoring 223 would have come fifth or sixth. This year it's at the bottom of the pack. There are many reasons why this might be the case, but the result is that consumers have a wide choice of effective AV packages, making for a highly competitive market.

Fortunately, we've refined our review process this year. With so many great packages to choose from, we needed more numbers and more data on which to judge these packages. Read on to find out how we test and how you can make the best choice.

TESTING METHODOLOGY
Throughout our reviews we'll be referring to the results of some key tests. These are carried out by Dennis Technology Labs (DTL), a division of Dennis Publishing, the company that owns *Computer Shopper*. DTL is run by a former *Shopper* writer.

DTL carries out three main tests: Protection, Legitimate Software and System Impact. The Protection Score is the most important one, as it tells you how well the software protects against real-life threats.

The tests DTL performs are really a worst-case scenario. Its testers act like totally naïve PC users, going to the most virulently infected websites, downloading software without hesitation and ignoring any safety warnings that pop up. Each package is subject to the same set of 100 threats, and their performance is turned into a weighted Protection Score. The maximum score is 300, and the worst possible score is -500. Here's how it breaks down:

+1 point for a neutralisation where the malware was allowed to run but was halted by the anti-virus package

+2 points for neutralising a running threat and removing all traces of the threat

+3 points for a successful defence, where the malware wasn't able to run

-5 points for a compromise

Compromises are punished heavily by our scoring system. Just a couple of failures in this part of the test can cripple a software package's rating. Each time these tests are carried out, DTL focuses on the most common threats to appear over the past few months. All tests are carried out on identical PCs running Windows 7 SP1, which remains the most widely used desktop OS despite the launch of Windows 10.

The second set of tests challenges the software's handling of legitimate programs. DTL's testers downloaded and installed 100 popular pieces of software on their test PCs and made a note of every time the AV packages took action against them, noting this down as a false positive. This year, most of the packages were pretty well configured to allow legitimate software to run, although they failed on a handful of occasions, which we'll mention in our reviews.

running, the effect on copying large files, application launch times and audio conversion times. There are too many tests to mention in every review, but we'll draw attention to notable results and give you the overall System Impact Rating.

EXTRA FEATURES
Most AV packages on the market come with extra features. Many of these are far from essential and some are nearly identical across products from different companies. A few of them aren't a complete waste of time, though, and one or two are useful additions.

You often get a password manager that integrates into your web browser. These can do a number of useful things, such as generating strong passwords and autofilling password forms, store checkouts and other webforms. Everything is protected by a master password that only you know.

Parental controls are another possible inclusion. These vary slightly but they generally let you block adult content using preset filters and customisable lists of banned URLs. Many also allow you to limit the time your children can spend online.

You'll no doubt be familiar with browser toolbars – and you've probably spent hours trying to get rid of them in the past. Now AV companies want you to put them back, with extensions and toolbars that grade links based on reputation. These can slow down the loading of web pages and make them look extremely ugly to boot, but they can still be a useful tool for those in your life who take a more liberal attitude to clicking on every link that appears on Facebook.

APP YOUR HANDS
Many of the packages we've reviewed this year have their own mobile apps. Generally available for Android, some also work on iOS. You'd be hard-pressed to tell the difference between many of them, though, as they all

Testers act like totally naïve PC users, going to the most virulently infected websites, downloading software without hesitation and ignoring any safety warnings that pop up

New for this year is the System Impact Rating. It's been a long-requested part of our AV Group Tests and we're happy that we can finally introduce it. System Impact data is taken from DTL's Annual Report, which is based on data from the previous 12 months. DTL performed system tests with each AV package, taking each result, weighting it and turning that into a System Impact Rating, which is a percentage score.

The Impact figures take into account how much hard disk space the software occupies, system startup and shutdown times, *Shopper* benchmark results with and without a scan

have largely the same features, including an anti-theft alarm and remote device wiping. These two features in particular are hotly competitive although almost entirely moot when you consider that Android offers its own device management service for free.

The most interesting thing some of these apps can do is provide you with a privacy breakdown – a list of the apps on your phone and their permissions. It's a useful way of checking that your apps aren't going rogue, but this feature is rarely worth the asking price. We'll take a quick look at apps from all the nine contenders in our reviews. ➥

AVAST
Free Antivirus
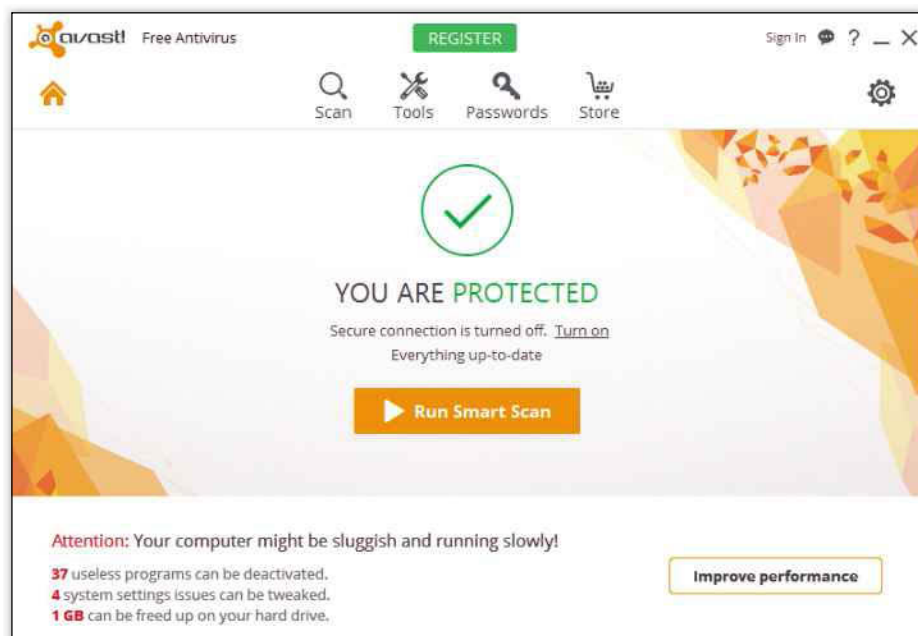
★★★☆☆

Free • From www.avast.com

VERDICT
A reasonable free product, but protection scores are disappointingly low

AVAST IS BEST known for its free products, although it also offers paid-for versions with additional tools. The free software provides a decent number of baseline security measures, but if you shell out for Internet Security or Premier, you get other useful tools including a firewall, anti-spam tool and automatic patching of apps with known vulnerabilities.

PROTECTION AND PERFORMANCE
We tested the free version of Avast as it's a very popular piece of software. It has done well in the past, but its performance took a bit of a downturn in our latest tests, dropping behind AVG. Of the 100 threats we exposed it to, Avast successfully defended against 88 before they were allowed to run on our system. Three more were neutralised before they could do any damage. However, it was the nine threats that managed to compromise our PC without intervention that left us concerned. This dropped its overall Protection Rating to 224 out of 300, the lowest score bar one and four points behind AVG. Its performance wasn't quite so bad in the legitimate software tests, where Avast proved fairly unobtrusive, blocking the installation of only one piece of legitimate software.

Its impact on system performance is higher than we'd like. We were surprised to see that the software took up over 1.6GB of our test system's hard disk and added a full eight seconds to its boot time, slowing it from 17s to 25s. System performance wasn't too badly affected overall, with smaller tasks taking only a fraction longer than they would without the software installed. Avast gets a Performance Impact Rating of 8%.

EXTRA FEATURES
The free version of Avast is fairly light on extras, as the company would rather you pay for its premium software. Still, it has some potentially handy features such as a seven-day trial of Avast's SecureLine VPN, which usually costs £45 a year. While a seven-day trial isn't that useful, it could be a good way to watch geo-blocked content such as BBC iPlayer while you're on holiday for a week.

You can also run quick scans for outdated software, although it doesn't seem to keep track of many programs: it recognised just five of the dozens of applications on our test PC. You can also scan for browser extensions in Google Chrome, Mozilla Firefox and Internet Explorer that have a 'poor reputation'.

Avast also has a browser password scanner that looks at the passwords you've asked your browser to remember and analyses them for security, presenting you with a (probably) rather worrying picture of your password situation. This is now, for the first time, free with the security software.

Avast also offers to scan your PC for junk files, claiming to have found 1.48GB of stuff we didn't want and a load of programs that should be removed. Dealing with the results means signing up for a £1.25 per month service, which we wouldn't bother with.

The settings menu is well-stocked and, for the most part, free of entries trying to get you to pay for things. You can make fine changes to the way Avast scans – for example, by choosing whether or not it scans programs when you first start them up. You can also beef up protection by enabling Hardened mode, which makes it more difficult to run harmful files. Finally, there's a gaming mode that lets you disable pop-ups and warnings when a full-screen application is open.

For a free product, Avast is a decent piece of software, but the slight downturn in its protection performance is a shame. It still offers excellent baseline protection, but if you're setting up anti-virus for someone who is less experienced and more likely to find their PC infected, it might pay to shell out for one of the better-performing products, such as Kaspersky Total Security.

Avast Mobile Security Mobile Security

Avast's Mobile Security App is very basic. It can scan your installed applications and recent downloads for malware but doesn't go much further than that. Most of the buttons are just links to other Avast apps.

Like many of the other mobile apps we've looked at, it's the anti-theft app that caught our interest. It's a familiar idea, with a cleanly designed, web-based interface and some GPS tracking tools. You can also set your device's camera to take pictures of the thief remotely and even activate the microphone to record the phone's surroundings.

Not only that, but if you're feeling particularly vulnerable to theft, you can switch on the geofencing feature, which will mark your device as missing if it goes a predetermined distance from your current position. As soon as your phone leaves the area it will go into lockdown, an emergency contact will be notified and you can begin tracking its location using the web interface. It's a decent little app and goes beyond most other anti-theft features you'll find.

Protection Rating

0	50	100	150	200	250	300

224

System performance impact (lower is better)

8%

0	10	20	30	40	50	60	70	80	90	100

AVG
AntiVirus Free 2015

★★★☆☆

Free • From www.avg.com

VERDICT
Resource hungry, with patchy protection, AVG Free is still better than nothing

AVG AND AVAST are neck-and-neck in the free AV race, so it's always interesting to see how they stack up against each other each year. Like Avast, AVG offers a £45 Pro version that includes download scans, file encryption, email protection and a firewall, but we'll stick with the free version for this review

PROTECTION AND PERFORMANCE
AVG was the best-performing free, third-party AV package this time around, beating Avast. Its Protection Rating of 228 is four points higher than Avast's 224, but neither score is really anything to be proud of. That score of 228 conceals a puzzling set of results: AVG fully defended against only 72 of the 100 attacks, neutralising a further 22 after they'd started running. Six attacks were able to run uninterrupted. It's an unusual score as none of the other suites on test allowed so many viruses to run before finally eliminating them.

At least AVG isn't particularly onerous, although on the one occasion it objected to us installing a legitimate piece of software, it halted the installation without telling us, which is irritating to say the least.

You couldn't call AVG Free svelte, either. It took up a full 973MB of space on our test PC, and slowed system startup from 17s to 28s.

Even worse, our 1.8GB file copy benchmark took 40 seconds – over three times longer than a PC with no anti-virus installed and nearly double Norton Security's time. As such it achieved a system performance impact score of 11% – one of the highest from any security software we've tested.

EXTRA FEATURES
As you might expect from free software, AVG Free is light on extra features. It's slightly confusing, however, with two separate programs that operate almost identically. A button in the main program takes you to AVG Zen, a secondary free program that acts as a management interface for other devices you've registered with AVG. We don't really understand why Zen is installed by default, as many users will probably just want to protect one device. It serves no purpose unless you intend to activate another PC or handheld.

AVG's main menu has five clear sections: Computer, Web, Identity, Email and Firewall. The first four have coloured circles showing your progress towards protecting yourself in each area. To fill the Computer progress bar, for example, you have to pay for AVG Pro and enable Data Safe, a file encryption tool. To complete Web, you need to get Pro and enable Online Shield, which scans files as they're being downloaded. To unlock the Firewall progress bar, you have to pay for Pro.

Included with the free package is an email scanner, which automatically installs itself into Microsoft Outlook and adds a "Scanned by AVG" footer to every email you receive. The Advanced Settings menu is great for those who like to tinker. It doesn't beat around the bush either: there are no over-simplified options that activate and deactivate whole swathes of the program. Instead, you're presented with a full list of every weapon AVG has in its arsenal and it's up to you to choose which to use. Fortunately, an easy-to-understand help file explains each option.

AVG just beats Avast for security prowess, but sluggish system performance leaves us concerned that living with AVG won't be much fun. It offers a reasonable level of protection but still can't match its paid-for rivals, such as Kaspersky Total Security, which managed a perfect protection score in our tests.
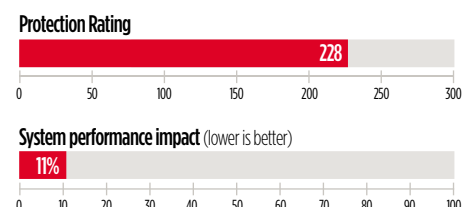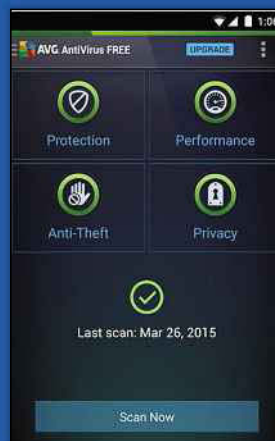
AVG AntiVirus Free – Security Scan

AVG's Android app, like its desktop offering, is completely free and offers a range of simple features. You can check all your apps for potentially dodgy privacy settings, clear space on your phone and even track your phone using AVG's anti-theft web interface. These features don't stand out from those of other free tools, and it's worth bearing in mind that recent versions of Android are good at showing you privacy information and app battery consumption, clearing space on your phone and even locating your device.

The Pro version costs a one-off £7.59 and unlocks some slightly more useful features. You can lock specific apps with a passcode if you don't want other people to access them. The Pro version also has a tool that lets you back up your apps to your phone's SD card to restore later. This is particularly useful when you're changing phones and don't want to download all your apps again and, more importantly, don't want to lose saved games and other data.

Pro also unlocks additional anti-theft features, including a 'camera trap' that snaps a picture of anybody who enters your password incorrectly three times, and allows you to lock your phone if the SIM card is removed.

AVG's Android app is perfectly serviceable, if not particularly inspiring. It is mostly free, at least, while its paid-for features are reasonably useful.

Protection Rating

0	50	100	150	200	228 250 300

System performance impact (lower is better)

0 11% 10	20	30	40	50	60	70	80	90	100	

MICROSOFT Security Essentials

MICROSOFT SECURITY ESSENTIALS is a tool that only works with Windows Vista and Windows 7. It's not available for Window 8 and 10 because it's baked into the operating systems. Security Essentials is a baseline form of protection: it shouldn't be used as a replacement for other AV packages. In recent
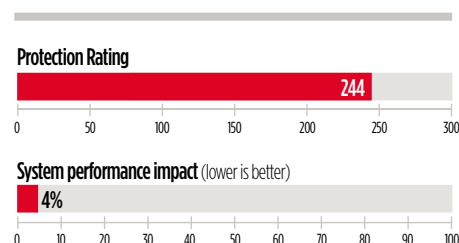
years, it has had a torrid time in our tests, but this year it's made huge improvements, responding to threats with relative aplomb.

Of the nine suites on test here, it was the sixth best with a Protection Rating of 244 out of 300. It successfully defended against 88 attacks, neutralising eight more before they could do any damage. It left six to run riot on our test PC, putting it on a par with AVG AntiVirus Free.

Security Essentials is an incredibly lightweight piece of software. It takes up just 279MB of disk space and barely affected our PC's boot time, increasing it by just two seconds from 17s to 19s. Its scans are slow, though, taking more than 14 minutes on our clean test PC, and they're fairly CPU-intensive, too. Luckily, Security Essentials lets you schedule scans so they don't interrupt you during the day.

Security Essentials was unobtrusive when it came to installing legitimate software, too. It didn't throw up any messages in response to the 100 installers we ran.

Security Essentials has greatly improved, and as baseline protection its very effective. If you're running Windows Vista or 7 and don't want to upgrade to Windows 10, Security Essentials lives up to its name – you should have it installed to keep your system safe.

Protection Rating

| | | | | | 244 | | |
|0|50|100|150|200|250|300|

System performance impact (lower is better)

| 4% | | | | | | | | | |
|0|10|20|30|40|50|60|70|80|90|100|

Locking down Windows 10

WINDOWS 10 USERS don't need Microsoft Security Essentials because the underlying technology is built into the operating system as standard. You shouldn't rest on your laurels, though: here are a few very simple ways to make Windows 10 more secure without installing any extra software.

USE A STANDARD USER ACCOUNT FOR YOUR EVERYDAY WORK

This may sound like a faff, but it's a great way to make sure you're fully aware of all the goings on in your PC. In practice it means that any time a program tries to make changes to your system, you have to type in administrator credentials to allow it. This goes beyond simply pressing 'yes' whenever Windows pops up a dialog box, so you really have to think about what's going on. It also means that if any malware manages to take hold of your PC, the damage will be limited to your user account – an Administrator account, on the other hand, can make changes to every other user on your PC.

To change your account to a Standard account, search for 'accounts' in the Start menu and select 'user accounts'. Click on 'Change your account type' and Choose Standard. If this is greyed out, you'll need to create a new Administrator account first.

DON'T SWITCH OFF THE SETTINGS

If you've ever been tempted to mess around with Windows' security settings, take this opportunity to make sure you haven't turned off anything crucial. Search for 'Security' in the Start menu and select 'Security and Maintenance'. In the Security tab, check that all the settings are switched on, especially User Account Control and Windows
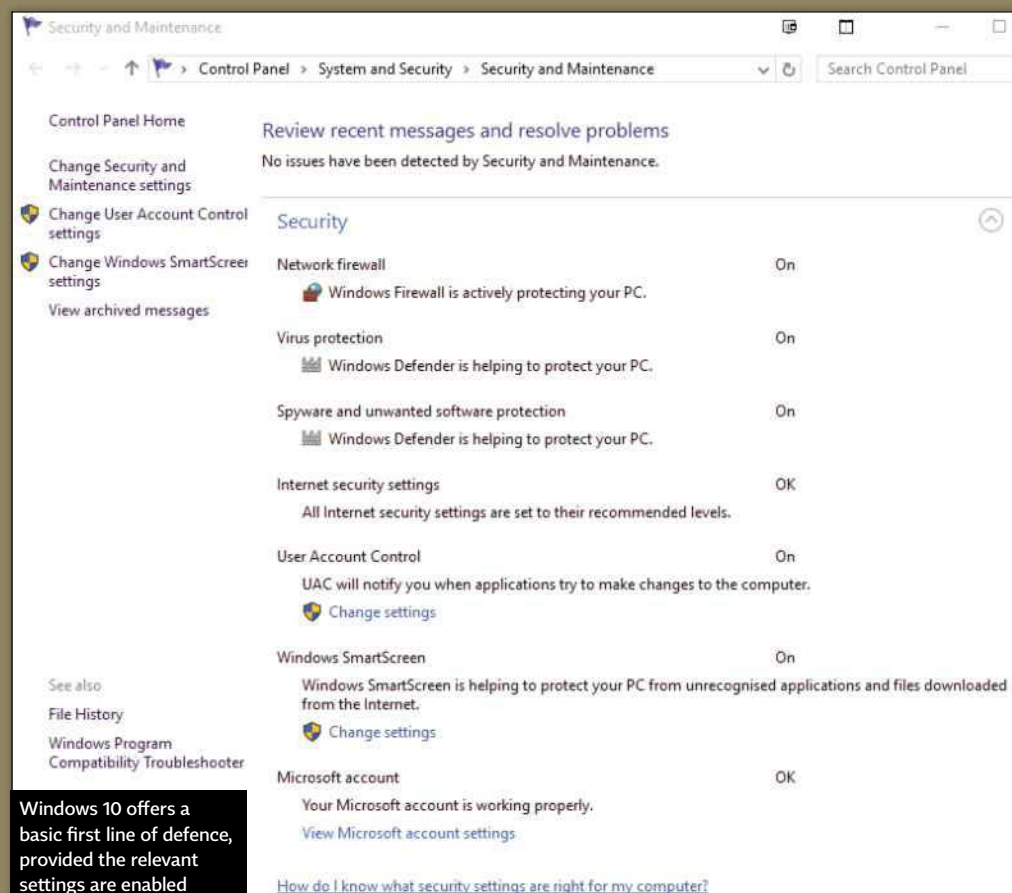
Windows 10 offers a basic first line of defence, provided the relevant settings are enabled

SmartScreen. You should beef up the settings on both of these if you have children who use your computer.

PROTECT YOUR CHILDREN

You don't need the parental controls that premium AV suites offer. Instead, if you're

using Windows 10, you can simply keep track of your child's behaviour, set limits and block websites using Microsoft Family. To do this, go to *account.microsoft.com/family*. From here you can add your child's email address (if they don't have one, you'll need to make one) to your Family.

BULLGUARD
Internet Security

★★☆☆☆

£50 per year • From www.bullguard.com

VERDICT
BullGuard is let down by sub-par malware protection and resource-heavy software

BULLGUARD OFFERS A generous 60-day trial for its software, giving you two months to decide whether it works with your lifestyle and workflow. Internet Security is the second tier of its selection of suites, sitting between the £70 Premium Protection and the AntiVirus product costing £25.

PROTECTION AND PERFORMANCE
BullGuard lagged behind its rivals with a Protection Rating of just 223 out of 300 – a point behind Avast as the two scrapped for last position. It successfully defended against 83 attacks, managing to neutralise a further nine before they could do any damage. That left eight pieces of malware to run riot on our test system, which is a poor performance.

BullGuard was a little hesitant about allowing in legitimate programs, throwing up dialog boxes on three occasions. It wasn't as bad as McAfee's approach, which is to block without explanation, and we don't think many users would mind the occasional dialog box.

More intrusive is the impact BullGuard had on our system's performance, where it scored 13%. It took up a huge 1.2GB of hard disk space during our tests and added 15s to our system's boot time, taking it from 17s to 32s. It also doubled the time the PC took to copy our 1.8GB of test files, taking the operation from 13s to 27s. We're not happy with the impact BullGuard had on our system, especially considering its below-average protection scores.
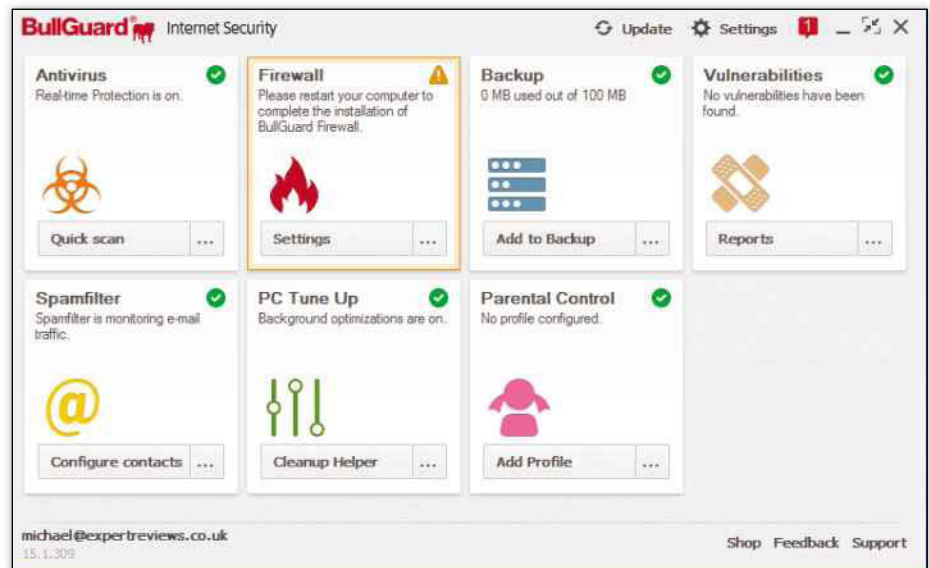
EXTRA FEATURES
This is a shame because BullGuard is a highly configurable piece of software. The main screen is split into seven clearly labelled sections. Each has a primary action (such as Quick scan for the AntiVirus menu) and a menu of secondary options (such as Full Scan

As well as the anti-virus and firewall tools, BullGuard scans for out of-date-software and other vulnerabilities

and Scan Folder), making it easy to find the tools you'll use most often.

As well as the anti-virus and firewall tools, BullGuard scans for out of-date-software and other vulnerabilities and cleans up what it perceives to be junk. We have to take issue with the latter: as soon as BullGuard launches for the first time it scans and cleans your system, which is a huge leap for a piece of software that has only just been installed. On our system it decided to clean out all our log files, temporary files and crash dumps, deleting over 1GB of files without consulting

us. It was only by checking BullGuard's Reports menu that we were able to see what it had done. This setting is also on by default so it will delete everything it perceives as junk as soon as it sees it. Shoot first, don't ask questions is BullGuard's policy. BullGuard was also concerned by our huge Downloads folder and Chrome cache. Luckily, it decided not to delete those automatically and asked us first.

BullGuard has all the parental controls you'd expect. You can block sites by category (although some of the definitions are vague, such as 'bad taste') as well as specific URLs. BullGuard has presets for different ages that unblock more categories for older children.

An easy-to-use scheduling tool lets you schedule hours during which your children are allowed to use the internet and the PC. You can also block specific applications, although these blocks are always active rather than timed. You can also prevent the transmission of specific number and text strings, such as credit card numbers, to ensure your kids can't rack up debts on your credit card.

BullGuard is an inadequate package with below-average protection scores and software that looks and feels dated while simultaneously slowing down your system. It's not cheap, either, and £50 for three devices is above the going rate: Kaspersky Total Security is the better choice.
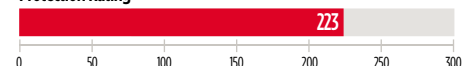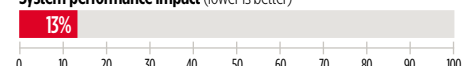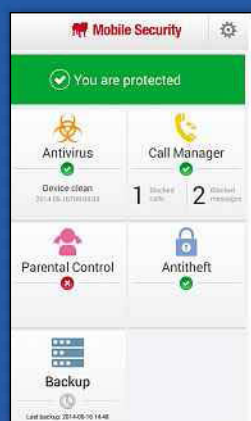
BullGuard Mobile Security

BullGuard's mobile offering is separate from its other products and costs £17 a year. It comes with most of the features you'd expect from a mobile security package, including parental controls that let you manage the device remotely, create block lists for calls and texts and set up anti-theft tools.

The anti-theft tools include SIM protection, which locks the phone when the SIM card is removed. You can also track your missing device using the web interface, sending 'scream' notifications in an attempt to locate it. You can also wipe your device remotely if all hope is lost and you don't want your data to get into the wrong hands. If you think the phone can be retrieved, you can remotely lock it with a passcode.

There's nothing beyond what the free services from Avast and McAfee do, and since it's not included in other BullGuard subscriptions, there's little point in downloading BullGuard Mobile Security.

Protection Rating

| 0 | 50 | 100 | 150 | 200 | 223 | 250 | 300 |

System performance impact (lower is better)

13%

| 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |

ESET
Smart Security 9

COMPUTER SHOPPER RECOMMENDED ★★★★☆
£40-£105 per year •
From shop.eset.co.uk

VERDICT
**Lightweight and reliable, but you pay a premium for it**

ESET SMART SECURITY has ranked consistently highly in our tests over the past few years. The company takes a no-nonsense approach to its software, keeping the fear-mongering and family protection horror stories to a minimum. You could say it's the rational consumer's choice, at least from its branding.

We tested ESET Smart Security 9, but other ESET products are available with slightly different tools, such as the lightweight ESET NOD32 Antivirus software and a mobile app (see below). ESET Smart Security is fairly expensive compared with its rivals: £40 a year for one device is a fair whack of cash.

PROTECTION AND PERFORMANCE
Smart Security 9 excelled in out tests with an overall Protection Score of 290 out of 300. It defended completely against 97 of the 100 attacks we sent its way, and neutralised two more after allowing them on to the system. One piece of malware was allowed to run unhindered, however. ESET was the third-best protector of our test PCs behind Kaspersky and Norton. It also managed a perfect Legitimate Software Rating of 720, allowing us to run and install software without throwing up warnings or blocking installation.

This unobtrusive behaviour continued in our performance tests. It only affected the boot time of our system by four seconds, taking it to 21s with Smart Security 9 installed. It was rather more leisurely when it came to its first system scan, taking over 14 minutes
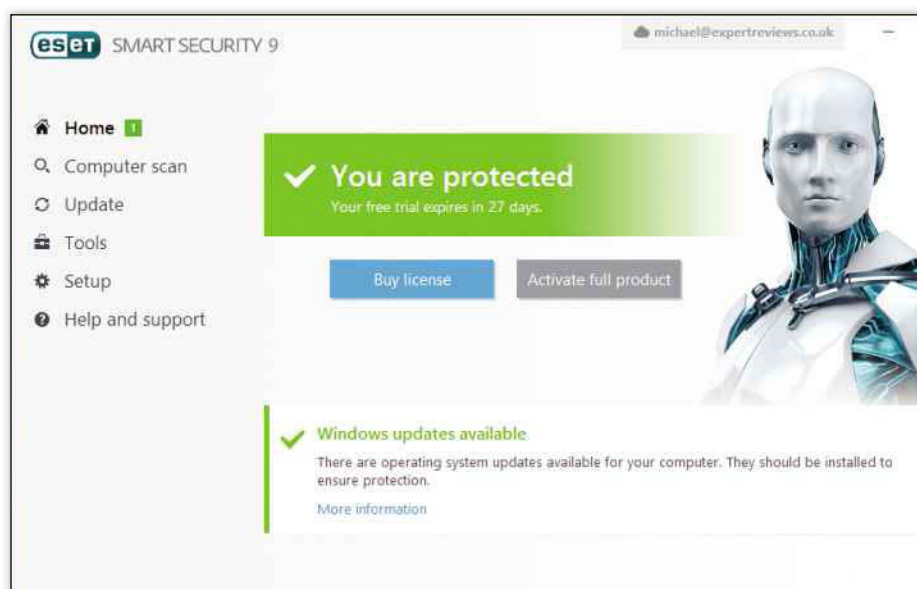
on our relatively empty test system. Subsequent scans were similarly slow at 12m 16s – ESET is nothing if not thorough.

At least it has a very small system footprint. Overall, ESET Smart Security 9 achieved a performance impact of 5%, which

is the second-lowest, beaten only by the svelte Microsoft Security Essentials.

EXTRA FEATURES
Despite focusing mostly on virus swatting, Smart Security 9 has a roster of other tools for monitoring your system, including a list of running processes and their security reputation. There's also a link to ESET's free recovery software, which you can put on a bootable USB stick and use to scan your hard disk before Windows boots.

ESET provides a sandboxed version of the Chrome browser, too, which is a safer way of entering sensitive data such as financial information. Finally, the software offers an anti-theft tool, which you can activate on all the PCs and handhelds that are licensed to

The company takes a no-nonsense approach, keeping the fear-mongering and horror stories to a minimum

run ESET. Simply log in to your Anti-Theft account on each device and you can track them through a web-based interface. GPS info, screenshots and webcam snapshots are available, and the tool will let you know what programs are running on your missing device. Depending on which device is missing, the results will vary in usefulness. Laptops don't typically have GPS sensors, for example, so you'll be left with fairly hazy location information if your device is stolen in a built-up area with many potential locations.

ESET Smart Security 9 is an effective anti-virus tool that sits quietly in your notification area and won't get in your way unless it needs to. It's expensive for a single licence, however, and fairly steep if you opt for the Multi-Device Security plan, in which case you'll pay £60 a year for six devices. Still, if your priority is a sleek and reliable piece of anti-virus software, ESET Smart Security 9 is a top choice, but Kaspersky Total Security achieved perfect protection in our tests.

Protection Rating
290

| 0 | 50 | 100 | 150 | 200 | 250 | 300 |

System performance impact (lower is better)
5%

| 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |

ESET Mobile Security

ESET's Android app costs £10 a year and isn't included in the Smart Security package. It is, however, included in the £60 Multi-Device option, so if you have lots of devices to protect, this could be a sensible choice. Like the desktop application, the Android app is free from any big red warning labels and scaremongering, and it has some useful tools, including Anti-Theft and the ability to set up remote wiping by SMS – simply set up a passphrase and if ESET spots it in your inbox, it will wipe the phone.

You can also set up phone call and SMS blocks – both inbound and outbound – and audit your apps to see which are making use of Android's various permissions. It's a useful way to see at a glance any apps that might be overstepping their bounds. This is a good all-round piece of software, but it's a little expensive.
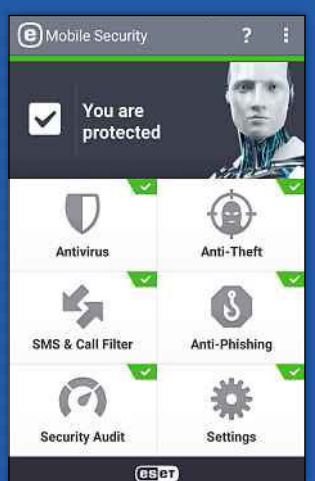
KASPERSKY
Total Security

COMPUTER SHOPPER BEST BUY ★★★★★
£30-£56 per year •
From www.kaspersky.co.uk

VERDICT
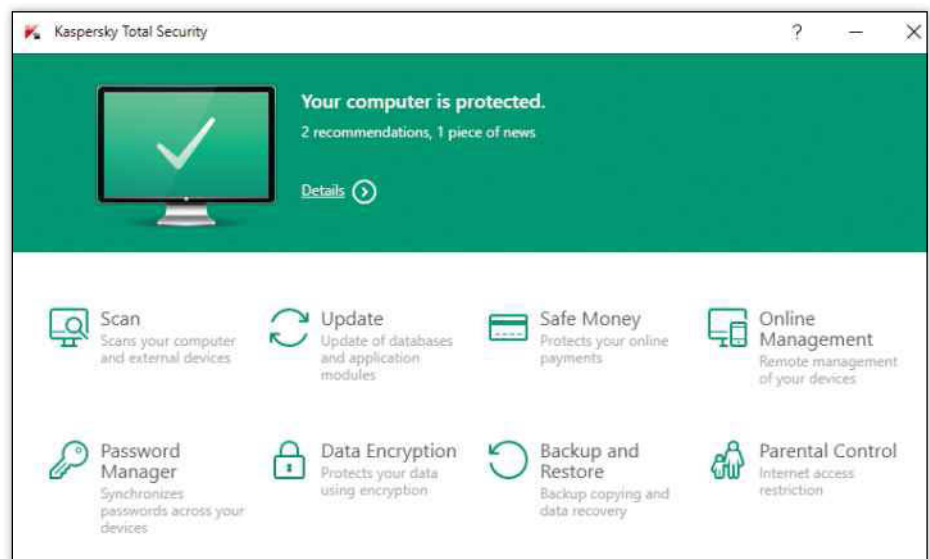**Perfect protection scores and lots of extra features make Total Security fantastic value**

KASPERSKY'S RANGE OF security products can be a little bewildering at first, with Anti-Virus, Internet Security and Total Security all marketed alongside one another. Anti-Virus is the cheapest option at £30, but it doesn't contain all the security features of Kaspersky's more expensive products.

The anti-malware elements of Internet Security and Total Security are identical, so our Protection Scores apply to both. We decided to test Total Security because of its extra features, but if you don't feel you need them, Internet Security is a cheaper option with the same system-level protection.

PROTECTION AND PERFORMANCE
Kaspersky was the only product on test to achieve a perfect Protection Rating of 300, halting 100% of the attacks we threw at it. Unlike most anti-virus software, which sometimes let a threat run before neutralising it, Kaspersky didn't even let them get that far. The software dealt with all 100 threats before they could run, either through scanning or by stopping the offending file being downloaded at all. Despite catching all of our malware, Kaspersky didn't get in the way at all when we tried to install legitimate software – allowing us to run all the programs we tried to install on our test PC.

Kaspersky's system footprint is slightly larger than that of ESET Smart Security, with an overall system performance impact rating of 7%. This is partly due to its very large size: nearly 800MB on our test system. If you use a cheap netbook with just 32GB of built-in storage, that could be a problem. Our test system also took five seconds longer to boot than it would have without any anti-virus installed. That's a couple of seconds slower than Norton and one second slower than ESET Smart Security. Overall, though, it's a lightweight piece of software that shouldn't cause any noticeable performance problems in day-to-day use.

EXTRA FEATURES
Kaspersky Total Security is a fully featured software package with a large array of extra tools to justify the subscription costs. Kaspersky has spent a great deal of the last year building its brand around protecting families, and if you buy Total Security you'll also get a licence for Safe Kids, Kaspersky's separate parental controls application.

Total Security itself offers some simple parental control settings, including an adult website filter, adult software filter and settings that let you limit how long your child can browse on weekdays and weekends.

Away from the parental controls, there are some useful diagnostic tools for keeping an eye on your PC. A Task Manager-like interface shows you CPU and RAM usage, while the network monitor provides a slightly more user-friendly view of your bandwidth usage totals than Windows' own Resources Manager. There's also a file shredder and a tool for creating a rescue disk, which can scan your PC for malware before Windows boots, bypassing the craftiest malware that hides itself or disables your anti-virus protection when Windows has booted.

There's a Password Manager that integrates with Google Chrome, Mozilla Firefox and Internet Explorer. Microsoft Edge isn't supported. You can also buy the Password Manager tool separately for £10.49 a year if you don't have Total Security.

Remote management is included too, although it's not particularly useful unless you have an Android device. The web-based interface lets you run scans and enable features on your Windows PC or laptop, but it extends no further than that. If you install the Android app (see box) you can wipe your device remotely, take a snapshot with the front-facing camera and sound an alarm if you think you might just have mislaid it at home.

Kaspersky Total Security is the only package on test to achieve both a perfect Protection and Legitimate Software score. That in itself is impressive, although with such stiff competition and such a high standard in this round of testing, there's less variation than usual. Kaspersky's software has a small system footprint and is reasonably priced, too, and the included smartphone anti-theft tools are very good indeed. If you use all the tools provided, it's very good value.
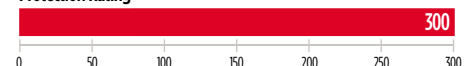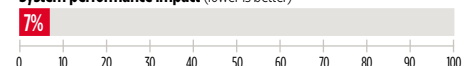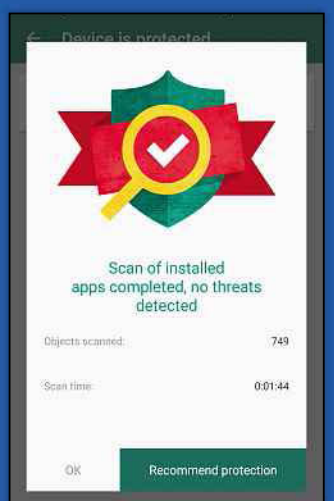
Kaspersky Internet Security for Android

Kaspersky's Android app costs £10 a year but is included in Total Security. It's most useful if your device goes missing, as the app and the web interface are easy to use for tracking and locking your handheld.

As well as fairly powerful anti-theft features, it has an anti-virus scanner that looks at both verified apps and those downloaded from outside the Google Play store. It can also monitor files in real-time, and offers a sandboxed web browser and SMS and call-blocking. Unlike tools from ESET and Norton, you don't get a neat list of apps and their permissions, which is a shame.

It's not particularly compelling by itself, but if you have a Total Security subscription, it's a handy addition, if only for the anti-theft tools.

Protection Rating

0	50	100	150	200	250	300

300

System performance impact (lower is better)

7%

0	10	20	30	40	50	60	70	80	90	100

McAFEE
Internet Security

★★★☆☆

£30 per year • From www.mcafee.com/uk
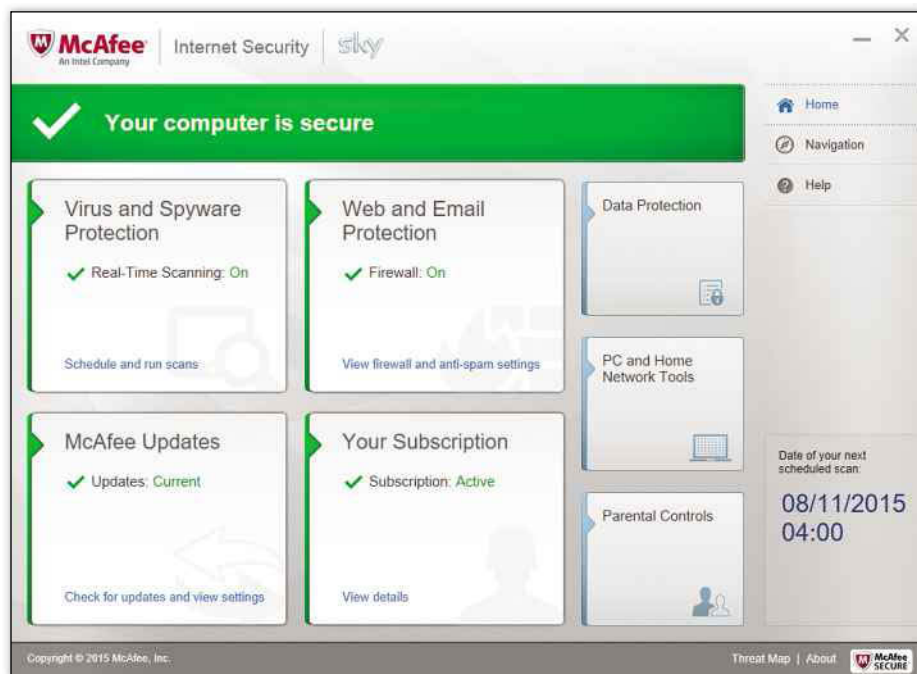
VERDICT
McAfee's high malware protection is let down by dated, resource-hogging software

McAFEE IS ONE of the most recognisable names in security software, which is due in part to the fact that it is preinstalled on so many new laptops. Sky customers also get a free one-month trial of the firm's software. Internet Security is in the middle of McAfee's range, but at £30 a year for a single PC, it's decent value. It offers all the basic features you'd expect from a Windows-based suite.

PROTECTION AND PERFORMANCE
McAfee has always been one of the most mercurial performers, but in recent group tests it has made steady gains, culminating in one of its best ever results in this year's tests, where it managed a Protection Rating of 278 out of 300. The software swatted 95 of the 100 threats we sent its way and managed to neutralise a further three attacks before they caused any damage. Two threats were allowed to run on the system without intervention, which hurt McAfee's overall score and puts it on a par with Trend Micro.

McAfee had a larger impact on system performance than many of its rivals. It blocked installation of two programs without any prompt or explanation, which is very bad practice in our book. Its footprint on overall system performance was rated at 9%. It takes up more than 1.1GB of hard disk space and slowed Windows' boot time from 17s to a lethargic 29s. It also badly affected how long the system took to copy files from one folder to another – 1.8GB of files transferred in 32s, whereas a system without an AV package would take just 13s. These annoyances make McAfee substantially less attractive.

EXTRA FEATURES
McAfee's interface looks old-fashioned, and while we're not fans of over-engineered UI designs, we'd say that McAfee's is in serious need of a refresh. The main menu is divided into seven sections, but if you prefer, you can use a simpler interface with all the menus in list form, making it much easier to find what you're looking for. The General Settings menu is a mess of buttons, with individual categories hiding single toggle options, which makes tweaking settings a real pain.

Even worse, with no built-in help system, McAfee directs you to its support website to explain features and terminology. The website does at least explain things in plain English, so you'll be able to make an informed decision about the settings you're about to change.

A parental settings menu lets you limit what your children can do at a given time and block websites that you or McAfee deem unsuitable. This is well implemented – simply pick from the age-based presets and McAfee automatically assigns what's blocked and what's allowed. If your child is under five years-old, for example, McAfee will block everything apart from websites it deems 'kid safe'. If you choose the 9-12 years setting, you'll unlock categories such as streaming websites, games and social networks. If you don't agree with McAfee's choices, you can add and remove categories and block domains manually. Elsewhere in the package, you get a junk file cleaner and a file shredder for secure deletion of files you don't want anyone to be able to recover.

McAfee is a little irritating to use, with a dated interface and a nasty habit of hogging the system. Its protection scores are good, so at least you can be confident that McAfee is protecting you from the latest threats, but Kaspersky Total Security's perfect protection scores make it the better choice.
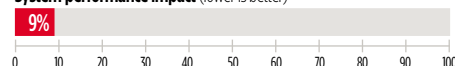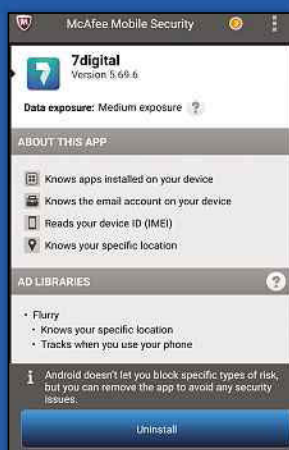
McAfee Mobile Security

McAfee's Android app is much stronger than its Windows equivalent, which is rare in this market. While it contains most of the same features you'll find on other mobile security apps, McAfee does them well and without fuss.

For example, its app privacy scans are based not only on the app's local permissions but also on research conducted by McAfee itself. This means it can give you better information on popular apps, including details of which ad network the app uses. While that information has little practical use (how do you know which ad networks to trust?), it's interesting and a nice way of summing up your current privacy situation. It's also free of warning signs and danger notifications – McAfee calmly explains that you should uninstall apps you don't trust and those you feel are overstepping their mark when it comes to privacy.

The anti-theft tool is fairly standard, with a web interface, remote locking and remote wiping. You can also set up McAfee Mobile Security to snap a photo with the front-facing camera if someone is trying – and failing – to unlock your phone.

The best part is that the app is free. You're served ads, but we only ever saw Intel and McAfee banners at the bottom of the app. Alternatively, you can pay £30 per year for an additional online backup service, telephone support and no ads, which is hardly worth it.

Protection Rating

| 278 |

0   50   100   150   200   250   300

System performance impact (lower is better)

| 9% |

0   10   20   30   40   50   60   70   80   90   100

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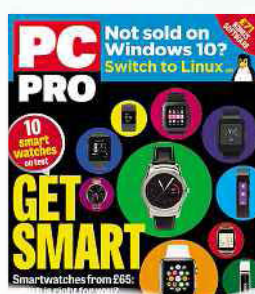
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SYMANTEC
Norton Security

COMPUTER SHOPPER RECOMMENDED ★★★★☆
£30-£50 per year •
From uk.norton.com

VERDICT
Top-notch security software and a great user interface, Norton Security is a great choice

SYMANTEC HAS CHANGED the way users pay for Norton Security. Rather than buying a new version with a new name each year, users pay a rolling subscription for a frequently updated service. Several options are available: Standard (£30 a year), Deluxe (£40 a year) and Premium (£50 a year).

Besides increasing the number of licences (one, five or ten), the higher tiers unlock extra features, some useful, others less so. Single users won't need the family-focused Premium version, for example, and can probably stick with Standard – or Deluxe if they have more than one PC or handheld device.

PROTECTION AND PERFORMANCE
On Windows PCs, Norton Security scored a near-perfect 298 out of 300 – just a fraction behind Kaspersky Total Security's perfect score. Norton Security batted off just about every threat we threw at it, and only lost two points for allowing a potential threat to run before neutralising it.

It was just as accurate when it came to installing legitimate software. At no point during our tests did it pop up unnecessary warnings about risky software. This indicates well-calibrated threat monitoring software and means Norton Security won't be a pain to live with day to day – one of the main reasons you might want to stop using a given service.

In our new system performance rankings, Norton Security proved to be among the least obtrusive packages available. It's not small – it takes up 393MB of disk space – but that's relatively lightweight compared with its competition. It increased system startup time
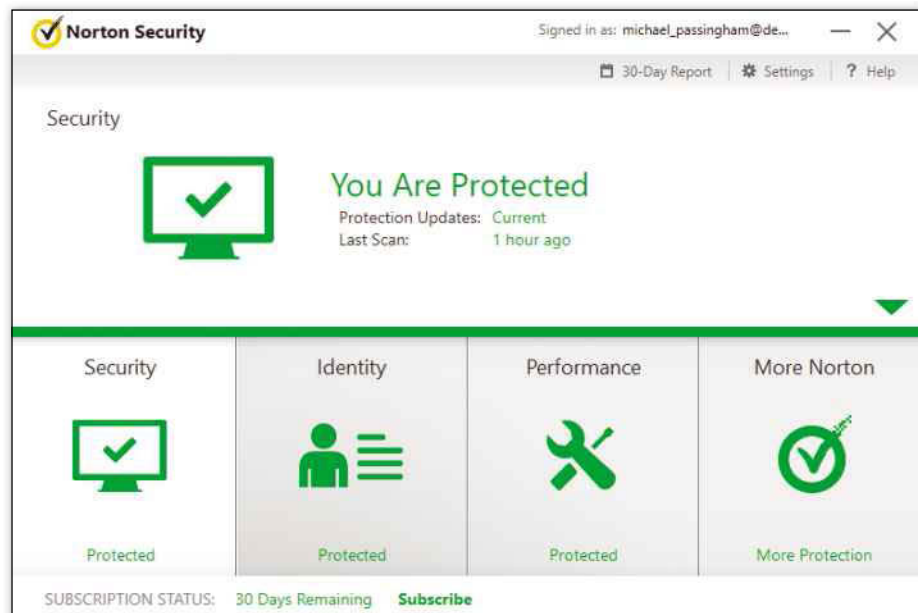
from 17s to 20s, a small price to pay for increased protection. Its scans are pretty quick, too: our first system scan took a little over nine minutes, while a subsequent scan was completed in just over two.

With all the other numbers crunched, Norton Security gets an overall system impact rating of 7%, which puts it in third position behind ESET Smart Security and Microsoft Security Essentials for performance impact.

EXTRA FEATURES
Besides basic security, Norton Security has a dizzying array of extra features, although the

System performance tools let you see which programs run on startup, ranking them for performance impact. This is no different to Windows' own built-in startup tools, but here you can set applications to delay their startup for five minutes. A space-saving file clean-up tool rounds off the Standard extras.

If you pay for the Deluxe version, you get access to Android and iOS apps (see box), as well as a web interface that lets you manage your devices' security remotely.

The Premium version adds Norton Family, which is a surprisingly powerful tool for the price. This lets you set rules and monitor your

In our new system performance rankings, Norton proved to be among the least obtrusive packages available

precise set depends on the package you buy. The Standard package includes the extra tools we've become familiar with in recent years, such as a password and financial information manager, a password generator and a toolbar for your web browser (if you choose to install it) that provides an additional layer of protection when browsing the web.
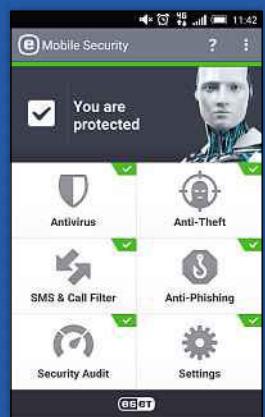
children's online activity, both on PCs and Android smartphones. It runs as a separate application to Norton Security, monitoring web activity, watching for flagged phrases such as credit card numbers and also allowing you to monitor where your child is using GPS. The GPS feature worked brilliantly, and we were able to lock on to our test phone's location instantly, a feature that many worried parents will appreciate.

Norton Security is as good as it ever was, with top-ranking protection, a small system footprint and some decent extra tools. Those extras are expensive, though, and £50 a year for Premium is a little steep. Kaspersky Total Security is a better buy for most people and has marginally better protection.
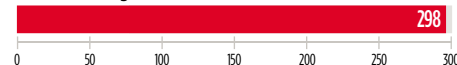

Norton Mobile Security OS: Android and iOS

Norton's free mobile offering for iOS is hardly worth bothering with, as it merely adds a backup feature and a 'find my phone' tool that's built into the operating system anyway. This is part of the free Android version too, which also includes some rather worrying warnings about the apps you've installed on your device – too much scaremongering for our liking.
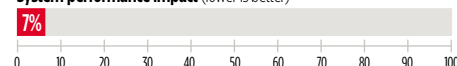
If you pay for the premium version (which you'll get if you have a Deluxe licence) you also get tools that keep an eye on battery usage, as well as an anti-phishing tool that warns you about potentially suspect websites. They're all fine additions, but the anti-theft tools are by far the most useful.

Protection Rating

| | | | | | | |
|0|50|100|150|200|250|298 / 300|

298

System performance impact (lower is better)

7%

| | | | | | | | | | | |
|0|10|20|30|40|50|60|70|80|90|100|

TREND MICRO
Maximum Security 10

★★★★☆

£42 per year • From www.trendmicro.co.uk

VERDICT

Decent malware protection, but it's not particularly good value

TREND MICRO OFFERS two packages for Windows PCs: Internet Security 10 and Maximum Security 10. Both use the same underlying technology, but Internet Security 10 comes with fewer extra tools and costs £35 for a single licence. For £7 a year more, Maximum Security adds protection for your mobile devices and other features, including a sandboxed browser and a password manager.

PERFORMANCE AND PROTECTION

Trend Micro had a fairly patchy year in 2014, as a few too many pieces of malware passed through its defences for our liking. This year, things have improved. Trend Micro defended against 96 of the 100 attacks we sent its way, neutralising two more before they could wreak havoc on our system. It did, however, allow two threats to run unabated, reducing its Protection score to 280 out of 300.

While its protection scores aren't perfect, it did at least achieve top marks in the legitimate software tests, leaving us free to install new programs on our test PC.

Trend Micro's impact on system performance isn't enormous. It takes up just under 900MB of our test PC's hard disk, and slowed boot time by just one second. System performance slowed slightly during scans,

particularly in more intensive tasks – a PC running Trend Micro was two minutes slower at rendering a video than one running Kaspersky Total Security. Copying 1.8GB of files with Trend Micro active was relatively slow at 32s, whereas a PC running Norton Security took just 21s. Trend Micro gets an overall Performance Impact Rating of 9%.

EXTRA FEATURES

As the pricier Trend Micro option, Maximum Security 10 comes with the extra features you'd expect from a premium AV suite. Sadly, it's buried in annoying animated menus that whizz around the screen for several seconds each time you click a button.

The interface is divided into four sections: Device, Privacy, Data and Family. Device lets you configure the anti-malware elements, with options for real-time and scheduled scans. Most options are explained well, so you won't have to look for explanations online.

From Device you can also perform a PC Health scan, which looks for resource-heavy startup programs, junk files and out-of-date versions of Internet Explorer and Flash Player. It also checks your user account settings to find ways you can easily bolster security. It's not particularly pushy or over-dramatic about these 'threats', which is refreshing.

The Privacy section offers a scanner that checks your social media feeds through a browser toolbar. It also checks your browsers for privacy settings such as Do Not Track. Finally, a data protection tool stops you and others who use your PC typing in personal information, such as credit card numbers. This didn't work in our tests, and we were able to send complete credit card numbers over WhatsApp and Facebook Messenger without Trend Micro so much as blinking.

The Data tab contains a file shredder, password manager and a tool that can scan files stored in your OneDrive cloud storage for malware without you having to download them. It's an interesting, if rather niche, idea and lets you keep files you don't trust at arm's length before downloading them. Then again, if you're that worried about a file, you should probably avoid it altogether.

The final tab provides parental controls, including content filters, time-limits for certain programs and the ability to generate reports about what your children get up to online. Trend Micro Maximum Security 10 is a decent suite with reasonable protection, but its high price and so-so system performance mean it's not the most attractive option. Kaspersky Total Security, with its perfect protection in our tests, is the better choice.
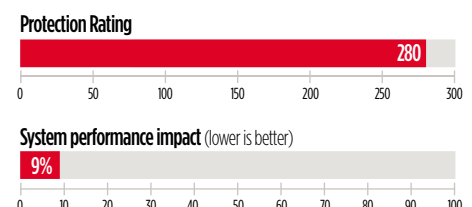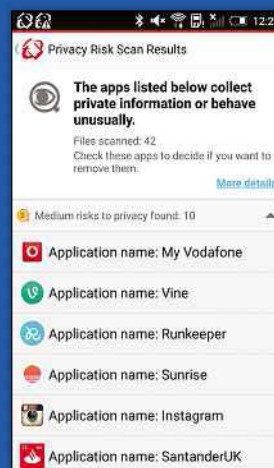
Trend Micro Mobile Security

Trend Micro's mobile apps are included in Maximum Security 10, or you can pay for them. The iOS version (£16 a year) has a site security scanner that checks sites as you visit them, plus a backup and restore feature and a Find My Phone tool – hardly worth paying for.

The Android version (£20 a year) is more comprehensive, with a virus scanner for apps and a privacy scanner that tells you what permissions your apps use. It's a bit scaremongery, with apps you can trust – such as Instagram – given the same treatment as an unknown free game that nobody ever downloads. Anti-theft features backed up by a web interface enable you to track a missing device and wipe it if necessary.

Its one unique feature is the 'Just-a-phone' mode, which switches on automatically when your battery is low. This stops all running apps, switches off mobile data and Wi-Fi and dims the screen. Most new phones have a battery saver mode but older handsets may not, so this could be handy.

We don't think either app is worth buying, although if you have a Maximum Security subscription, you can pick and choose which features you want to use for no extra cost.
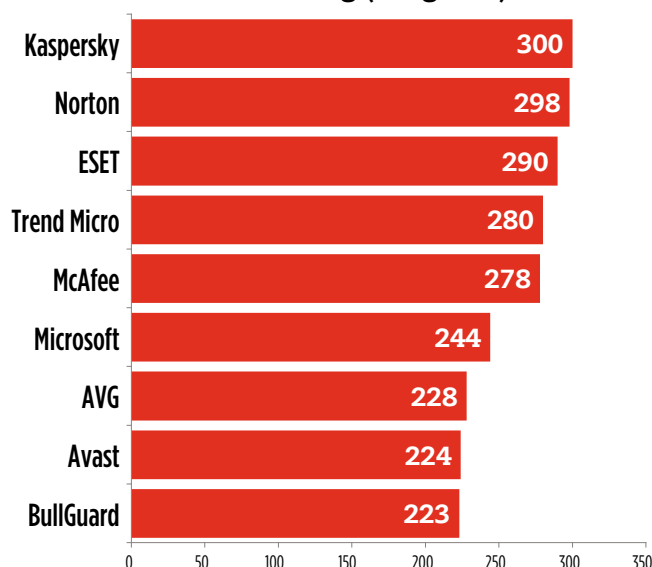

Protection Rating

0	50	100	150	200	250 300

280

System performance impact (lower is better)

9%

0	10	20	30	40	50	60	70	80	90 100

BENCHMARKS

Defended   **Neutralised**   **Compromised**

Performance

Protection Rating (weighted)

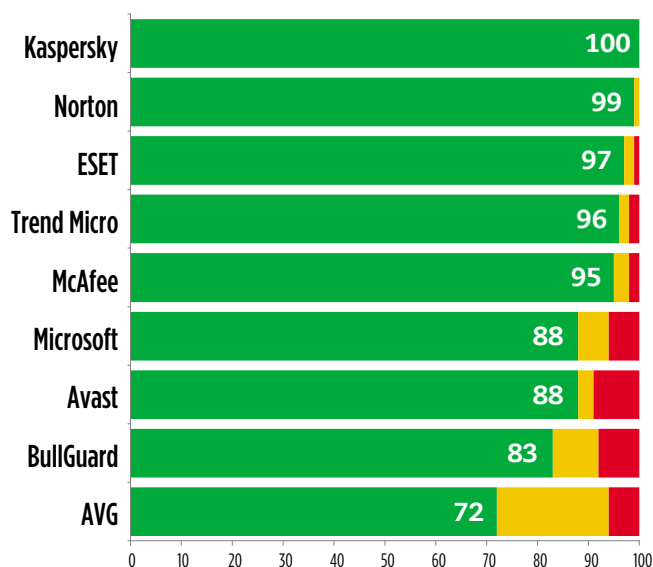| Product	Score
Kaspersky	300
Norton	298
ESET	290
Trend Micro	280
McAfee	278
Microsoft	244
AVG	228
Avast	224
BullGuard	223

The Protection Rating tells you how an anti-virus suite coped with malware in our tests. The maximum possible score is 300.
Neutralise (+1) If a product terminates a running threat, the result is a neutralisation. It protected the system and is awarded one point.
Neutralise, complete remediation (+2) The product is awarded a bonus point if, as well as stopping the malware, it removes all hazardous traces of the attack.

Protection Breakdown

Product	Defended
Kaspersky	100
Norton	99
ESET	97
Trend Micro	96
McAfee	95
Microsoft	88
Avast	88
BullGuard	83
AVG	72

Defence (+3): Products that prevent a threat running have 'defended' the system and are awarded three points.
Compromise (-5): If a threat runs uninhibited on the system, or the system is damaged, five points are deducted.

In the Protection Breakdown portion, we show you visually how well each product did. Note that defending against more attacks doesn't necessarily earn a suite a higher score.

Performance impact

Product	Impact
Microsoft	4%
ESET	5%
Kaspersky	7%
Norton	7%
Avast	8%
Trend Micro	9%
McAfee	9%
AVG	11%
BullGuard	13%
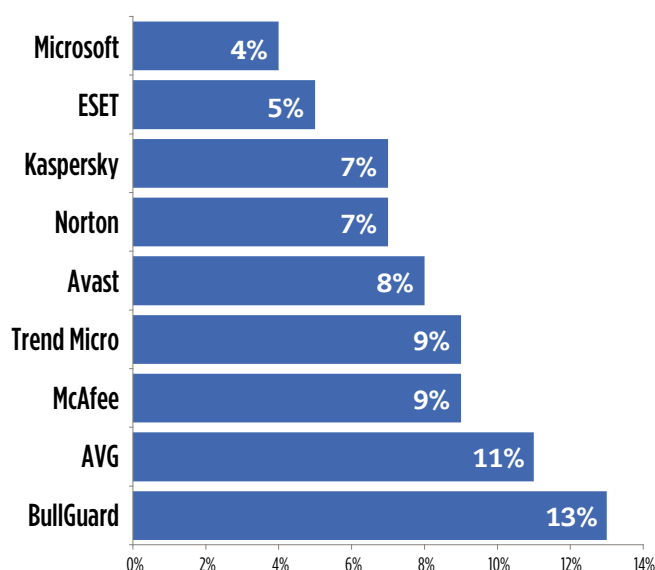
We ran tests to measure the impact products had on system performance. The ideal product would have no impact, or could potentially speed the system up for an impact rating of below zero.

The tests for system startup (above), shutdown and Windows program launch times have a weighting of 10. File copying performance has a weighting of eight, while performance benchmarks ranged from eight to five, depending on their length.

Windows boot time

Product	Time
Trend Micro	18s
Microsoft	19s
Norton	20s
ESET	21s
Kaspersky	22s
Avast	25s
AVG	28s
McAfee	29s
BullGuard	32s
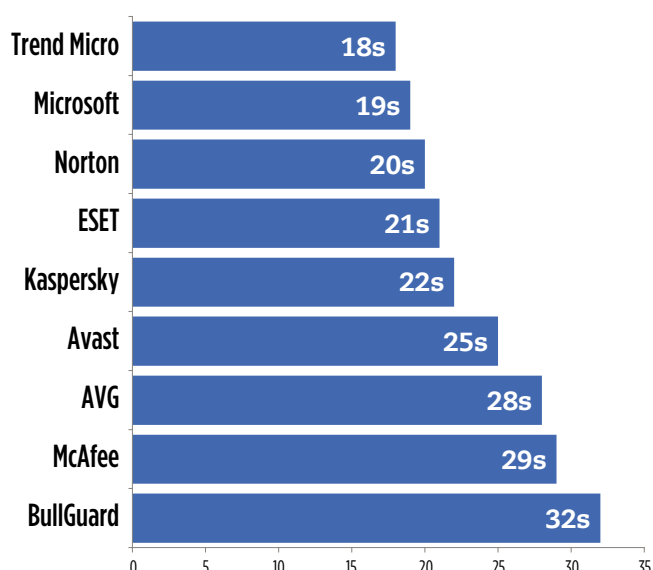
Meanwhile, we used a number of different methods to measure the test system's startup time. The aim was not simply to observe how quickly the system presented a Windows Desktop after being powered on – the Desktop had to provide a usable session too. The figures above are derived from the Microsoft Windows Performance Toolkit, although they closely matched other measurements taken with third-party tools and real user experience.

	AVAST Free Antivirus	**AVG** AntiVirus Free	**BULLGUARD** Internet Security	**RECOMMENDED** **ESET** Smart Security 9	**BEST BUY** **KASPERSKY** Total Security
	★★★☆☆	★★★☆☆	★★☆☆☆	★★★★☆	★★★★★
OS details					
Desktop OS Support	Windows XP, Vista, 7, 8, 10	Windows XP, Vista, 7, 8, 10, Mac OS X	Windows XP, Vista, 7, 8, 10	Windows XP, Vista, 7, 8, 10	Windows: XP, Vista, 7, 8, 10. Mac OS X 10.8+
Mobile app	Android 2.3+	Android, iOS	Android	Android 2.3 to 5.0	Android 2.3 to 5.0
Features					
Anti-virus	Yes	Yes	Yes	Yes	Yes
Firewall	No	No	Yes	Yes	Yes
Parental controls	No	Yes	Yes	Yes	Yes
PC cleaning	No	Yes	Yes	No	Yes
Email protection	No	Yes	Yes	Yes	Yes
Gaming mode	Yes	Yes	Yes	Yes	Yes
Remote management	No	Yes	No	Yes	Yes
Buying information					
Free version	Yes	Yes	60-day trial	One-month free trial	One-month free trial
Price including VAT	Free	Free	£50 per year	£40-£105	£30-£56 per year
Devices protected	Unlimited	Unlimited	Three PCs	1-10 PCs	1-10 devices
Supplier	www.avast.com	www.avg.com	www.bullguard.com	shop.eset.co.uk	www.kaspersky.co.uk
Details	www.avast.com	www.avg.com	www.bullguard.com	eset.co.uk	www.kaspersky.co.uk
Product code	Free Antivirus	AntiVirus Free	Internet Security	Smart Security 9	Total Security

	McAFEE Internet Security	**MICROSOFT** Security Essentials	**RECOMMENDED** **SYMANTEC** Norton Security	**TREND MICRO** Maximum Security 10
	★★★☆☆	No rating	★★★★☆	★★★★☆
OS details				
Desktop OS Support	Windows: XP, Vista, 7, 8, 10. Mac: OS X 10.7+	Windows Vista, 7	Windows: XP, Vista, 7, 8, 10. OSX: Current and previous two versions	Windows XP, Vista, 7, 8, 10
Mobile app	Android, iOS	No	Android, iOS	Android 2.3+, iOS 7.x, 8.x
Features				
Anti-virus	Yes	Yes	Yes	Yes
Firewall	Yes	No	Yes	Yes
Parental controls	Yes	No	Yes	Yes
PC cleaning	Yes	No	Yes	Yes
Email protection	Yes	No	Yes	Yes
Gaming mode	Yes	No	Yes	Yes
Remote management	No	No	Yes	No
Buying information				
Free version	30-day trial	Yes	30-day trial	30-day trial
Price including VAT	£30	Free	£30-£50 per year	£42 per year
Devices protected	One PC	Unlimited	Up to 10 devices	Three devices
Supplier	www.mcafee.com/uk	windows.microsoft.com	uk.norton.com	store.trendmicro-europe.com
Details	www.mcafee.com/uk	windows.microsoft.com	uk.norton.com	www.trendmicro.co.uk
Product code	Internet Security	Security Essentials	Internet Security	Maximum Security 10

Prices correct at time of going to press

MONITORS
Broaden your horizons

If your HD monitor is leaving you feeling a little hemmed in, it's time to stretch out sideways. With one of the five 2,560x1,440 screens on test, you can work on two applications side by side without covering your desk in screens

MOST PC MONITORS have 1,920x1,080 screens, but although that's reasonable for casual use, you might find the 1,920-pixel width limiting. It's just enough to let you place two windows side by side, but using more complex programs and websites can be tricky.

You could sit two 1080p monitors side by side, but that takes up loads of desk space and leaves you with a bezel in the middle. A far better solution is to buy a screen with a higher resolution.

This month we've tested five monitors with 2,560x1,440 resolutions, giving you 50% more pixels to work with. These include 27in panels for under £250 all the way up to a 32in behemoth that'll set you back £400.

What should you look out for when buying a big monitor? As you'd expect, image quality is an important aspect. This is determined to a large extent by the type of panel your monitor uses. The cheapest have twisted nematic (TN) panels. There are some impressive TN-based models on the market, but they differ wildly in quality. Characteristics that are commonly associated with TN panels include slightly narrower viewing angles and less accurate colour, but they have faster response times than competing technologies, which can make them better for gaming.

As panel technologies have improved, however, the difference between a TN panel and an in-plane switching (IPS) or vertical alignment (VA) panel have become less pronounced, especially among consumer-level monitors. IPS screens typically have the best colour accuracy and viewing angles, while VA achieves sky-high contrast levels thanks to extremely dark blacks.

In our tests, we measure colour coverage using the sRGB colour gamut – a fairly small gamut that covers a decent range of vibrant colours but misses the most extreme (and difficult to reproduce) shades you'll find in the Adobe RGB gamut used by photographers and designers. We also take colour accuracy into account: we run the monitor through a set of colours using DispcalGUI and our X-Rite i1 DisplayPro calibrator. In this test, the monitor is given a target colour, and the calibrator tells us how close the monitor was to displaying it. It then assigns a delta-E score. The lower the delta-E figure, the more accurate the colour. We also look at black levels and contrast, both of which make a difference to how well a monitor displays darker and more subtle shades.

Gaming performance is an important factor when choosing a monitor. With cheaper panels, you can end up with a fair amount of lag between your PC outputting a signal and the monitor displaying it. We use a Leo Bodnar input lag measuring device to see how long this delay is. A lower figure is better: the best monitors can manage sub-10ms input lag, but don't expect anything like that from the monitors we've looked at here.

CAN MY PC HANDLE 2,560x1,440?
It depends. If you have only a VGA connector, you're out of luck as this type of port usually only supports up to Full HD resolution. The same is true if you have a single-link DVI port or cable, but if you have a dual-link connector, you'll be able to display 2,560x1,440 images. HDMI is also tricky, as it depends which version your graphics chipset and monitor support. If you have HDMI 1.3 or later, you'll be fine. As this standard was ratified in 2006, this will be the case for most graphics cards and laptops. Finally, all devices with DisplayPort or Mini DisplayPort support a 2,560x1,440 resolution.

If you need a monitor with an adjustable stand and turntable, you'll end up spending at least £70 more. We generally prefer this kind of monitor, as we're not keen on using a stack of books to bring our screen up to eye level.

AOC
Q2577PWQ

£215 inc VAT • From ebuyer.com

VERDICT

Great image quality from this 25in panel, but a lack of USB ports limits its practical appeal

THE AOC Q2577PWQ is a 2,560x1,440 resolution monitor with an unusual 25in screen, which places it between standard 23in panels and slightly oversized 27in screens. It's a professional monitor, which means it comes with all the ergonomic bells and onscreen adjustment whistles and a price to match.

The high resolution gives you nearly twice the number of pixels you get with a standard Full HD monitor, but more pixels doesn't always mean a better viewing experience. High resolutions on smaller monitors can sometimes leave text illegible and programs too tiny to use, particularly in versions of Windows before 10. However, the AOC monitor's 25in panel is just large enough to make reading size-11 text possible without you having to adjust Windows' scaling settings.

The monitor's IPS panel is capable of displaying gorgeous images with vibrant colours. We measured its sRGB colour gamut coverage as 98.8% at its default settings, and the contrast level as 1,258:1. This, along with the reasonably low black level of $0.28cd/m^2$, helps images look punchy and vibrant while still managing to maintain plenty of detail in darker areas.

Colour reproduction in the sRGB space is exceptional. Our delta-E measurements, which measure the difference between the colour sent from a PC and the one the monitor actually displays, came in at an average of 1.08. A score of less than 1 is generally considered to be imperceptible to the human eye. The only colours that were noticeably off were deep blues, which came in with delta-E scores of around 4.

We also tested the backlight's uniformity, which proved to be only average. The bottom-centre of the screen, where the backlight is at its brightest, is around 20% brighter than the top-left corner. It's barely noticeable in normal use, though, and if you turn the monitor's brightness down to avoid eyestrain, you certainly won't notice.

Although this monitor wasn't designed with gaming in mind, it's a perfectly competent companion for non-competitive gaming.

Its 60Hz refresh rate is standard for professional monitors, and we measured an input lag time of 27ms. It's by no means quick but it's fast enough for many titles, although fans of twitchy shooting games will need to look elsewhere.

The onscreen menus are reasonably easy to navigate, although without a dedicated joystick they can be a little fiddly. There are a few features that some will find useful, such as the Picture Boost bright frame function, which allows you to select an area of the monitor to be darker or brighter so you can pick out details more easily.

The Q2577PWQ has ergonomics well covered. You can adjust the height of the screen by up to 105mm, and it can sit just 45mm above the desk at its lowest point. It also rotates, although as the mechanism is built into the base rather than the stand, the entire base shifts when you turn the screen, so you'll need plenty of space on your desk to rotate the monitor cleanly.

Build quality is of a high standard and the stand feels robust. Not everyone will like the silver metallic material that adorns the base and frame, but everyone will appreciate the wafer-thin bezels on the top, left and right of the screen, which have the effect of drawing your eyes into the screen.

We were a little disappointed by the lack of a USB hub. Many professional monitors come with at least a couple of USB3 ports, and the best come with four, with two connectors on the side and two on the bottom. The Q2577PWQ has no USB ports, however, which makes it a little less flexible than some of its professional rivals. Elsewhere, there are plenty of input options including single examples of DVI, HDMI, DisplayPort and VGA connectors, as well as 3.5mm audio input and output jacks.

The AOC Q2577PWQ is a great monitor with excellent image quality, but its 25in size may not suit everybody. What's more, its lack of USB ports is a disappointment in an otherwise fully featured and functional monitor. Having said that, if you want a high resolution and great image quality for not much cash, it's a great buy.

> The monitor's IPS panel is capable of displaying gorgeous images with vibrant colours. We measured its sRGB colour gamut coverage as 98.8% at its default settings

SPECIFICATIONS

SCREEN SIZE 25in ● **RESOLUTION** 2,560x1,440 ● **SCREEN TECHNOLOGY** IPS LCD ● **REFRESH RATE** 60Hz ● **VIDEO INPUTS** DVI, DisplayPort, HDMI, VGA ● **WARRANTY** Three years RTB ● **DETAILS** www.aoc-europe.com

CONNECTION PORTS

DVI   DisplayPort   HDMI

VGA
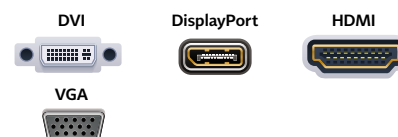
AOC
Q2778VQE

★★★★☆

£234 inc VAT • From www.ebuyer.com

VERDICT
The Q2778VQE has surprisingly good image quality for such a cheap 27in screen

IF YOU'RE ONLY interested in image quality and don't want any additional features, you can buy a decent screen at a very reasonable price. AOC's Q2778VQE is a perfect example, offering impressive quality on a budget by including no fancy extras whatsoever.

The screen is a little hard to love at first sight, with glossy black plastic as far as the eye can see. To say the bezels are on the chunky side is an understatement. It's not offensive, but those who want a little style will need to pay more for something higher up the AOC range. Still, the monitor is solidly built and doesn't wobble on its stand.

The monitor sits at a fixed 95mm high. There's no rotation in the base, but at least you get a generous amount of tilt. The lack of height adjustment may be a problem for some, especially if you value good posture. If you want to raise the monitor, you'll need to buy a dedicated stand or use a stack of books.

Fortunately, its vertical viewing angles are wide, so you can move your head freely without rendering the screen unreadable. Horizontal viewing angles are also reasonably wide, and the screen only became slightly darker at more extreme angles.

Despite using a cheap TN panel, the Q2778VQE's colour performance is credible. It displayed 98.9% of the sRGB colour gamut in our tests, which means the vast majority of colours are accurately displayed. The only real problem it had was with displaying bright reds, which were a little wide of the mark. A low average delta-E figure of 1.91 is acceptable for the money – the monitor was able to display most colours accurately.

The screen's contrast ratio of 1,049:1 exceeded our expectations, aided by a low black level of 0.28cd/m². Its maximum brightness is 322cd/m², which is impressively bright, if a little dazzling for a default setting. Viewing was more comfortable once we'd turned it down a bit.

Motion blur and ghosting can be a problem with cheaper monitors, but we had no such problems with the AOC Q2778VQE. There is a slight issue with the input lag time – we measured this as 38ms, which is on the slow side, especially if you plan to play games. A lag of 38ms is about what you'd expect from a large LCD TV, and although you won't notice this in normal desktop applications, games such as shooters, which require fast reactions, will feel notably more sluggish.

The onscreen menus offer a small selection of adjustments. These include contrast and brightness controls and a power-saving mode that reduces brightness levels. There are basic image adjustment controls, too, including colour temperature (Warm, Normal, sRGB, Cool and User). Selecting the User mode also unlocks the ability to adjust colour saturation for red, green and blue, so you can fine-tune colour to your liking if, for example, you want to minimise the amount of blue light coming from the screen.

Finally, a function called PictureBoost lets you select a portion of the screen and alter its contrast and brightness, as well as the size and position of this portion of the screen. The facility would be handy on a higher-quality or professional monitor where seeing graphics or a photograph under different conditions is important, but its usefulness on a cheap monitor is limited, especially when you consider how fiddly it is to set up using the monitor's menu buttons.

The AOC Q2778VQE is one of the cheapest 2,560x1,440 27in monitors you can buy, and if you accept the practical limitations of a monitor with fairly ugly styling and no ergonomic adjustments, there's little to dislike. It's not suitable for gaming but is perfectly serviceable for regular work and web browsing. You won't get much better for the money, but if you really want to appreciate the quality of your photos or videos, you'll probably have to pay little more for a higher-quality panel.

SPECIFICATIONS
SCREEN SIZE 27in ● **RESOLUTION** 2,560x1,440 ● **SCREEN TECHNOLOGY** TN LCD ● **REFRESH RATE** 60Hz ● **VIDEO INPUTS** VGA, DVI, HDMI, DisplayPort ● **WARRANTY** Three years RTB ● **DETAILS** www.aoc-europe.com

CONNECTION PORTS
DVI   DisplayPort   HDMI

VGA

IIYAMA
ProLite B2783QSU

★★★☆☆

£250 inc VAT • From www.overclockers.co.uk

VERDICT
A cheap 2,560x1,440 monitor with FreeSync support, but its image quality is compromised

THE IIYAMA PROLITE B2783QSU is one of the least expensive 2,560x1,440 monitors we've reviewed, but as is so often the case with cheaper products, compromises have been made to keep the price down.

At 27in, the screen is the usual size for this resolution. Iiyama has done a good job of thinning down the bezels, with the top, left and right bezels all just 9mm thick. They're finished in plain black plastic, while the bottom bezel has a brushed metal-style black plastic coating. It's an understated business-focused monitor without any showy features.

The stand is typically robust, with 100mm of height adjustment, portrait mode for document editing and a versatile turntable offering plenty of flexibility. Perhaps most important is the generous amount of tilt, which you'll certainly need because Iiyama has used a TN panel to keep costs down. TN is the cheapest type of panel technology and is great for budget screens, but this is obviously a cheap panel even by TN standards. Image quality is fine when you look at the monitor straight on, but it starts to go awry as soon as you're outside its very narrow viewing field.

Vertical viewing angles are the biggest problem. Sit just a fraction too low or high and either the top or the bottom of the monitor will appear noticeably darker. This means that if you're a bit of a fidget, you'll need to tilt the screen slightly whenever you change position to get a decent view. Horizontal viewing angles are fine, although if you're showing something onscreen to a colleague next to you, they'll see patches of dark yellow at the far edge of the monitor.

There are other problems, too. Fast-moving objects suffer from severe ghosting, with a light yellow trail that follows your cursor and any moving windows. This is only really a problem when just one object is moving onscreen – it's not something you'll notice when watching videos – but it's still an annoyance, and once you've spotted it, it's hard to ignore.

The screen's performance is actually impressive for such a cheap screen. At its default settings, it provided near-perfect sRGB colour gamut coverage of 99.7%. Colour accuracy is very

good, too, with an average delta-E of 2.51. Delta-E scores closer to zero are better, and aside from a rather wayward red delta-E of 6.77, the B2783QSU did a fine job. Of course, the ability to reproduce even the most challenging colours accurately is fairly pointless if you can only see them when

looking at the screen dead on.

Black levels are acceptably low at 0.37cd/m², while a peak brightness of 372cd/m² is extremely impressive. The backlight sustains this over the surface of the screen, with the top-right corner just 13% darker than the centre, which is acceptable for a monitor at this price.

There are HDMI, DVI and DisplayPort inputs at the rear of the monitor, and Iiyama has included a two-port USB3 hub to help reduce desk clutter.

If you use DisplayPort, you'll be able to use this monitor's elevated 70Hz refresh rate for slightly smoother cursor movement and gaming, although we honestly couldn't tell the difference between the 60Hz and 70Hz setting. Using DisplayPort also unlocks AMD FreeSync, the adaptive

sync technology that eliminates frame tearing when you're gaming. This only helps if you're using a PC with an AMD graphics card and your game is running faster than 48fps, which will require some fine graphical tuning.

You won't find a FreeSync monitor with this high a resolution for less, and a pixel

Iiyama has done a good job of thinning down the bezels, with the top, left and right bezels all just 9mm thick

response time of 1ms and a 10ms input lag figure are both very low. However, the severe ghosting characteristics may cause problems when looking at fast-moving objects in games.

The Iiyama ProLite B2783QSU is a tricky monitor to judge. It's one of cheapest 2,560x1,440-resolution monitors we've seen, but you pay for this low price with poor viewing angles and ghosting, which mean it isn't the best screen for gaming. If you're purely after more onscreen space and don't mind such problems, it's a decent buy. If image quality is important to you, however, you should spend a little more or sacrifice adjustability and buy the AOC Q2778VQE.

SPECIFICATIONS
SCREEN SIZE 27in ● **RESOLUTION** 2,560x1,440 ● **SCREEN TECHNOLOGY** TN LCD ● **REFRESH RATE** 60Hz (70Hz on DisplayPort) ● **VIDEO INPUTS** DVI, HDMI, DisplayPort ● **WARRANTY** Two years onsite ● **DETAILS** www.iiyama.com

CONNECTION PORTS

DVI	DisplayPort	HDMI

PHILIPS
272S4LPJCB

★★★☆☆

£335 inc VAT• From www.cclonline.com

VERDICT
Stylish with some useful features, but it's just too expensive for a TN monitor

THE PHILIPS 272S4LPJCB is one of the pricier monitors we've looked at this month, but you can see exactly why as soon as you lift it from the box. It's certainly a high-quality piece of kit. The most immediately striking thing about this monitor is its pleasing matt grey finish, which minimises reflections and doesn't pick up smudges or dust particularly easily. The crease on the thick bottom bezel adds a hint of design flair, as do the subtle status light and the curved speaker grille.

The silver stand and lightly textured rear panel make this a stylish monitor both from the front and the back. There's even a large cable-routing hole at the rear to help you keep pesky wires under control. The stand provides all the physical adjustment options you could wish for, with 12cm of height adjustment taking the screen from just a few centimetres off the desk to a decent height for those with higher seating positions. A smooth turntable rotates the screen, and there's plenty of tilt adjustment, too.

Default image quality is fine, although you might expect a little more for the money. You only get a TN panel instead of the IPS or VA screen you might expect at this price. It performs very well, though, covering 99.6% of the sRGB colour gamut at its default settings, while black levels of 0.31cd/m² (at a maximum brightness setting of 304cd/m²) mean dark greys and blacks in photos and videos.

The screen's colour accuracy is reasonable, if a little lower than we'd have liked for such an expensive monitor. We measured an average delta-E of 2.64, which was largely caused by greys that were a little off the mark and oversaturated reds.

When using the monitor for everyday tasks such as web browsing, email and document editing, we had few problems with its performance. Viewing angles were fine when looking at the monitor straight on, and even moving around to the side of the screen produced only a slight shadow effect on the image. The monitor also has a pair of 2W speakers built in. These are fine for speech and watching the occasional video clip, but that's about it. For anything else you'll want to use a pair of dedicated speakers or headphones, and Philips has placed a 3.5mm audio jack on the bottom of the monitor for the purpose. Most monitors have their 3.5mm jack on the back where it's less convenient.

The 272S4LPJCB has all the display inputs you'd expect from a professional monitor: DisplayPort, HDMI, DVI and VGA. There's also a 3.5mm audio input for use with DVI or VGA, which don't carry audio signals. We were a little surprised by the lack of any USB ports on this monitor, which is something we'd expect on a screen costing over £300.

Plenty of extra features are available in the onscreen menus, including a power-saving tool called Power Sensor. This uses two sensors on the front of the monitor that detect the distance between it and whatever's directly in front of it. If the measurement is above a certain point – for example, if you get up from your desk – the monitor dims to 20% brightness to save power, lighting back up again only when you return. There are four sensitivity modes to choose from. On setting 1, you have to be practically next to your monitor to wake it up, while setting 4 is less precious but still not as sensitive as we'd like.

There's also a picture-in-picture and picture-by-picture mode, which lets you view video from two sources at once. This could be useful if you need to have two devices connected but have only one screen.

The Philips 272S4LPJCB is a stylish business monitor with a few handy features and comprehensive adjustment options, but it's expensive for a model with a TN panel. Its image quality is practically identical to that of the far cheaper AOC Q2778VQE, which makes it a hard sell despite its many good qualities.

SPECIFICATIONS
SCREEN SIZE 27in ● **RESOLUTION** 2,560x1,440 ● **SCREEN TECHNOLOGY** TN LCD ● **REFRESH RATE** 60Hz ● **VIDEO INPUTS** VGA, DVI, HDMI, DisplayPort ● **WARRANTY** Two years RTB ● **DETAILS** www.philips.co.uk

CONNECTION PORTS

DVI　　　DisplayPort　　　HDMI

VGA
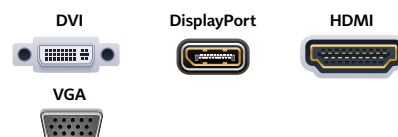
SAMSUNG
S32D850T

COMPUTER SHOPPER **BEST BUY** ★★★★★

£400 inc VAT ●

From www.laptopsdirect.co.uk

VERDICT
Superb design and great image quality make the S32D850T a worthwhile investment

THE 32in SAMSUNG S32D850T uses VA panel technology, a great all-round panel type that generally produces excellent contrast levels, accurate colours and wide viewing angles. A matt screen coating minimises reflections from artificial lights. Images appear rich and detailed, particularly in areas of subtle shading, and the high measured contrast ratio of 2,698:1 makes it perfect for viewing darker images, games and films. Blacks are inky dark, too: just 0.06cd/m² of light leaked through the panel when displaying pure black images. We measured a colour sRGB gamut coverage of 96.6% at the default settings, with most of the missing coverage from bright reds and oranges.

Input lag is a little higher than many gamers would like, varying between 28ms and 41ms according to our input lag tester. This may be a problem if you like to play very twitchy first-person shooters, which are dependent on low lag times.

In typical Samsung fashion, the physical design of this monitor has received as much attention as its specifications. The bezels are angled inwards, which looks distinctive and makes them appear thinner than they really are. The base of the monitor is very large but, more importantly, flat, so it doesn't look ugly or intrusive. The base doesn't move when you swivel the monitor, either, which means you won't disturb everything in the surrounding desk space when you change the S32D850T's position.

The S32D850T's stand is very well designed. Swivel, tilt and orientation adjustment are all controlled by a single ball and socket-style joint. This setup provides a generous amount of adjustment, which is easy to perform. It's also height adjustable, so you'll be able to find a position that suits you. Unusually, Samsung supplies a VESA mounting plate in the box, so you can even mount your screen to a stand or wall mount without having to buy extra hardware.

A high-speed USB3 hub with four connectors is built in, so you can connect all your desktop peripherals as well as high-speed storage. A removable cable tidy panel at the bottom of the stand aids easy routing. In focusing on making the monitor look good, however, Samsung has placed its ports on the rear rather than on the side, which makes them a little harder to access than we'd like.

The Samsung S32D850T has three display inputs: a single dual-link DVI port, DisplayPort and HDMI. It also has separate 3.5mm audio input and output jacks. There are no speakers, though, so if you're thinking of using this monitor with a games console, you'll need to buy speakers or headphones.

We've seen plenty of large monitors that offer picture-in-picture (PIP) and picture-by-picture (PBP) modes, but none of them has worked particularly well. Such modes can be handy because you can have the output of two devices onscreen at the same time, with one image inset, in the case of PIP, or two side by side with PBP. Typically, we end up with two squashed images because the monitor we've tested hasn't told the PC to adjust the resolution accordingly. The S32D850T deals with this, however, so as soon as you enable PBP, both your connected devices change their output resolution to create images at the correct aspect ratio and resolution. This means the S32D850T is a screen you can share between two computers simultaneously without problems.

The Samsung S32D850T is a superb 32in monitor that's suitable for both home and professional use. While it doesn't have 100% colour coverage out of the box, it's a very pretty monitor and displays rich and vibrant images. It's a great buy. **CS**

MAKE
Windo

Microsoft's new operating system is a real gem, but it can still take a bit of work to get things running smoothly. We've compiled the best tips and tricks to help you make Windows 10 perform and look how you want

There's an awful lot to like about Microsoft's latest operating system. It's arguably the greatest it's ever created, taking the best parts of its previous efforts and amalgamating them into one. Even so, it's not without its faults or puzzling decisions.

The good news is that many of these issues will be resolved over time, as Microsoft has been rather vocal about how much faster updates are rolled out. Microsoft has gone so far as describing Windows 10 as its 'last' operating system, as it moves to simply update the OS with new features over time.

But you can get your updates even faster if you're on the Insider track. We'll outline how to sign up for Insider builds in this guide. Even without Insider, not a week seems to pass by without a notification to say 'Updates have been installed'. You'll want to keep reading to make sure Microsoft isn't sneakily using your bandwidth to

deliver its updates to everyone over the internet.

Even without waiting for Microsoft to release updates, you can make Windows 10 even better yourself with just a little bit of knowledge. There are also plenty of hidden features you might not know about that can make your experience infinitely better.

Windows 10 is very customisable, meaning you can change its colours and themes to get it looking how you want. Cortana, Microsoft's personal assistant, is probably smarter than you give it credit for as well. We let you know how to get the most out of the feature.

When it comes to cloud storage, many of us rely on Microsoft's OneDrive to keep our files safe and accessible, but with Windows 10 its implementation arguably got broken for many of us with the removal of placeholders. We let you know how you can get them back. With 'God Mode' you can even give yourself all-encompassing power over every part of the operating system all from one place.

WS10
BETTER

Customise the Windows 10 Start menu

The Start menu may be back, but it probably doesn't quite do everything that you might want it to. Here are our essential tips to make it better

ONE OF THE worst things about Windows 8 was that it ditched the Start menu entirely, replacing it with the much-maligned Start screen. We have to say, though, that the Start screen did have some good things about it, which is why we're pleased to see Live Tiles integrated with a more traditional menu, as with Windows 7. While the Windows 10 menu will work well for most people, you don't have to put up with the default settings. Here's everything you can do to customise it to work the way you want it.

Make the Start menu full screen

By default, tiles live side by side with your programs list, giving you almost the best of both worlds. If you prefer Windows 8's full-screen Start menu, you can turn this back on in Windows 10. If this sounds like madness, you might want to give it a go; the way the Windows 10 menu appears and is used is much less intrusive and less slow than the Windows 8 version.

To turn on the full-screen menu, click the Start menu, then Settings. From the Settings menu, select Personalisation, then select Start from the list on the left. This will give you a screen with a lot of different toggles for the Start menu; the one you want to switch on is 'Use Start full screen'.
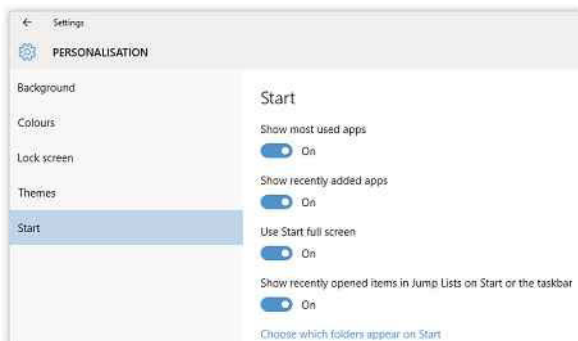
⬆ It's easy to turn on the full-screen Start menu

Now when you click the Start menu or hit the Windows key your Start menu will appear full-screen, but you'll notice that it's not as intrusive or as horrible as the Windows 8 version. To revert to the standard Start menu, you can just
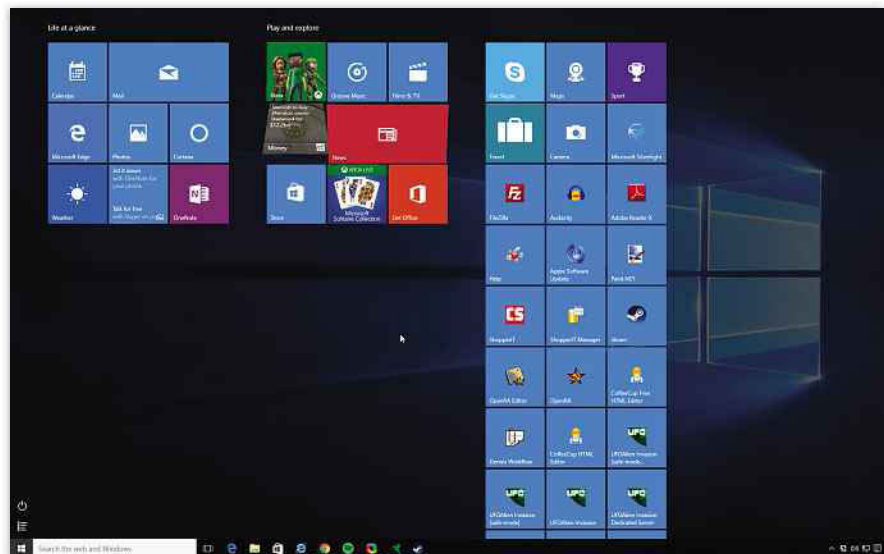
⬆ The full-screen Windows 10 Start menu is not as annoying as Windows 8's version

reverse the instructions above. The full-screen Start menu doesn't have a Settings link in it, but use the Cortana search bar to search for 'settings' and select the application from the search results.

Resize the Start menu

If you don't want the Start menu to dominate your entire screen, you can resize it by clicking and dragging from the top and sides, just as if you were resizing a Windows File Explorer window. You can resize both vertically and horizontally to get it how you want. Note that there's no option to put the Start menu back to its original size, although it's easy enough to resize it manually to roughly the same position.

Turn off suggested and recent apps

A recent Windows 10 update added the suggested apps feature to your Start menu, prompting you to download apps from the Store that Microsoft thinks you might be interested in. If you don't want to be bombarded with this kind of information, it's easy enough to turn off.

⬆ From big to small, you can make the Start menu the size you want it
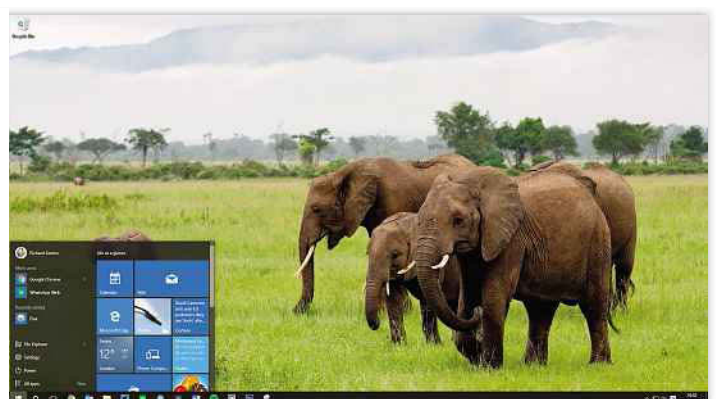
⬆ You can switch your Start menu to use solid colours if you don't like the transparency effect

The suggestions only appear occasionally, and if you happen to see one, you can simply right-click it and choose the option to turn suggestions off. If you don't see one but want to stop them appearing in the future, open the Start menu, click Personalisation and click Start. Turn off 'Show most used apps' and you won't get any more prompts.

Change the Start menu's colours and transparency

Windows 10 gives you bountiful options when it comes to choosing the look and feel of your Start menu. This includes choosing the colour of the menu and whether or not you want it to be transparent.

Navigate to the Personalisation part of the Settings application and select Colours. Untick 'Automatically pick an accent colour from my background' if it is selected. Now

Windows 10 gives you bountiful options when it comes to the look and feel of your Start menu

you'll be presented with a colour picker in various shades. Select the one you like and this will automatically change the accent colour, which, as the thumbnail image shows, is used for Live tiles and for highlights in windows.

If you want the colour to fill the entire Start menu, rather than leaving the default dark background, as well as other elements of the operating system, such as the taskbar, scroll down to the toggle labelled 'Show colour on Start, taskbar and action centre' and turn this on.

The Start menu and other Windows 10 elements, such as the Action Centre, have transparency effects turned on by

default. If you prefer to have solid colours, toggle the 'Make Start, taskbar and action centre transparent' option.

Turn off Live tiles

As in Windows 8, the tiles in Windows 10 can be set to display information from an app. The Photos app, for example, can show a scrolling slideshow, while the News app can show headlines. If you find these distracting or would rather they didn't appear, turning them off is incredibly easy. Simply right-click the tile and select 'Turn live tile off' to have it simply display a static icon. You'll need to do this on a per-app basis, so you can use this trick to selectively disable the most annoying apps.

You can make the Start menu practically any colour you want

If you don't want Microsoft's recommendations, you can turn off suggested apps

You don't have to have Live tiles for all apps, and can turn off the most distracting ones
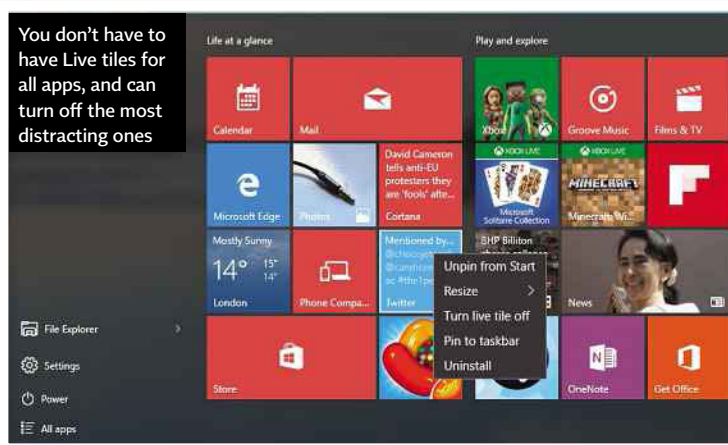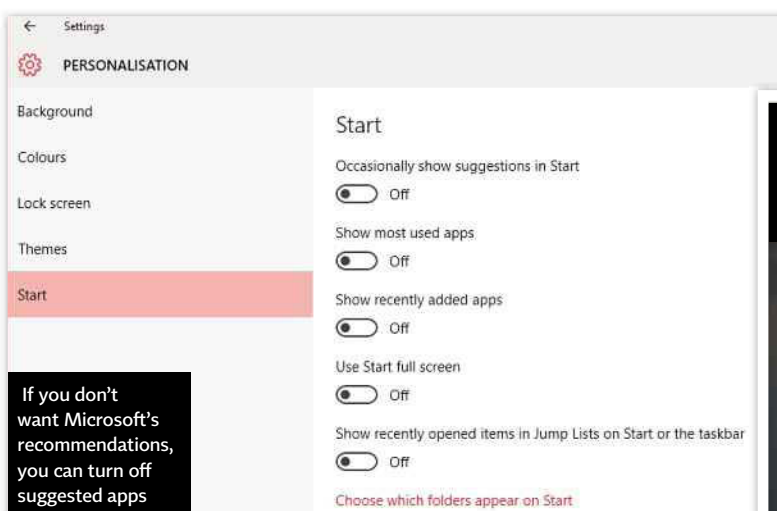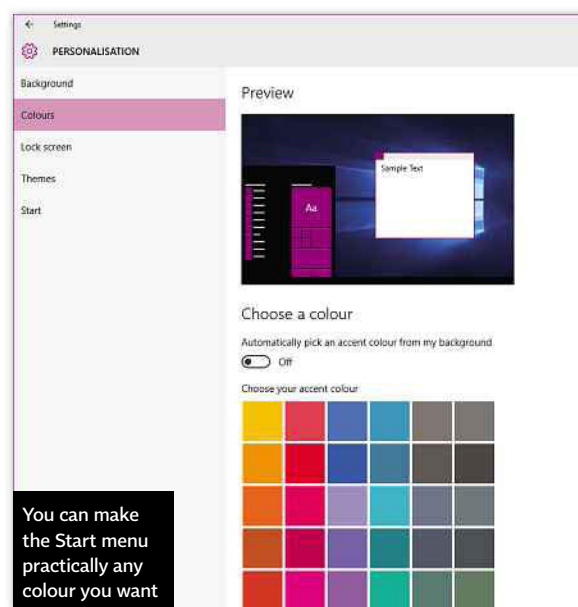
Improve Cortana

Microsoft's personal assistant can do more than simply return search results. Here's everything you need to know about making it better

SEARCHING DIRECTLY FROM the Start menu using Cortana is a great way to find applications on your PC and results on the web. As useful as that is, however, if you only use Cortana for this, you're merely scratching the surface of what it's capable of. Our in-depth tips and tricks will show you how to get more from the service and will even show you how to make it use Google rather than Bing as its search engine.

Redirect Cortana searches to Google

Searching directly from the Start menu using Cortana is incredibly handy, but not everyone wants to use Bing for search results (except perhaps Microsoft). If you use Google's Chrome browser, you can have your searches redirected through Google search instead through the Bing2Google extension from the Chrome Web Store.

Open Chrome and install the Bing2Google Chrome extension (*tinyurl.com/ofy4t3l*), or you can do a search for Bing2Google from your Start menu for a delicious taste of irony. Now when you conduct a web search from your

← You don't have to use Bing to search using Cortana if you use the Bing2Google Chrome extension

➡ You can tell Cortana what you're interested in, so it can show you tailored up-to-date information
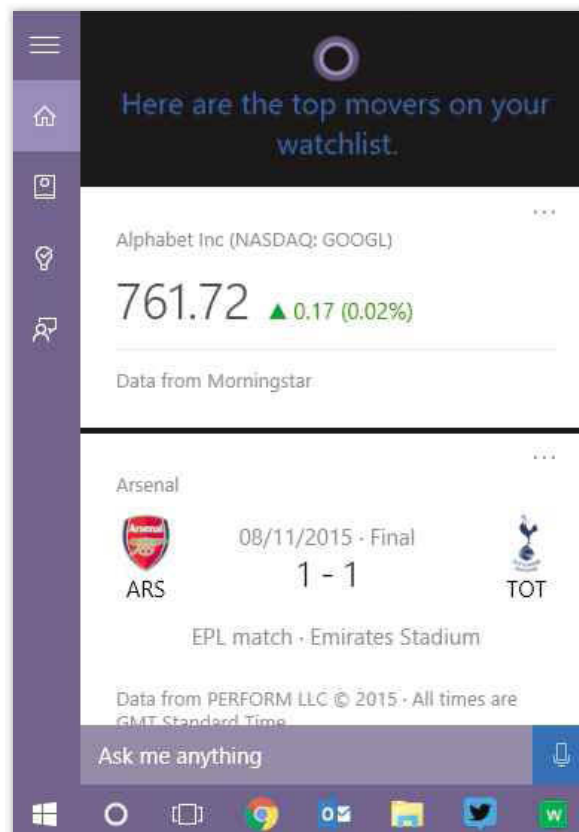
Start menu and select an option, a new Chrome tab will open with Google search results.

Use Cortana for instant information

Cortana can be an incredibly useful source of information provided you let the personal assistant know enough about what you're interested in. To do this, you'll need to fill in your

Cortana can be an incredibly useful source of information provided you let it know enough about what you're interested in

Notebook. First, open up Cortana by clicking the circular Cortana icon next to the Start menu button. Then select Notebo7, which is the second icon down.

You'll then be presented with a list of different interests that Cortana can keep you updated on, including Sports, Travel and Finance. This way, you can add information, such as a stock you're interested in, so Cortana can let you know the latest information.

Now, when you open up Cortana, you're instantly presented with the latest information such as that all-important stock performance.

Use Cortana for instant results

Maths

Cortana can also be used for simple calculations instead of opening up the Calculator application. Just type your maths problem direct into search and Cortana will give you the result. This even works with percentages, so you should have little need to go back to the Calculator app.

⬆ Why use Calculator when Cortana can work out most maths problems for you?

Currency conversions

You can also do currency conversions simply by typing in an amount. You can get results for either the standard currency code, such as '500MYR', or by typing out '500 Malaysian Ringgit' to get a conversion into your local currency (set by your Region and Language settings in Windows 10).

If you want to convert into a different currency, you can type in something like '500MYR in USD' to get the corresponding conversion rate.

⬆ Cortana can quickly give you the latest currency conversions based on live rates

➡ You can quickly set reminders using Cortana
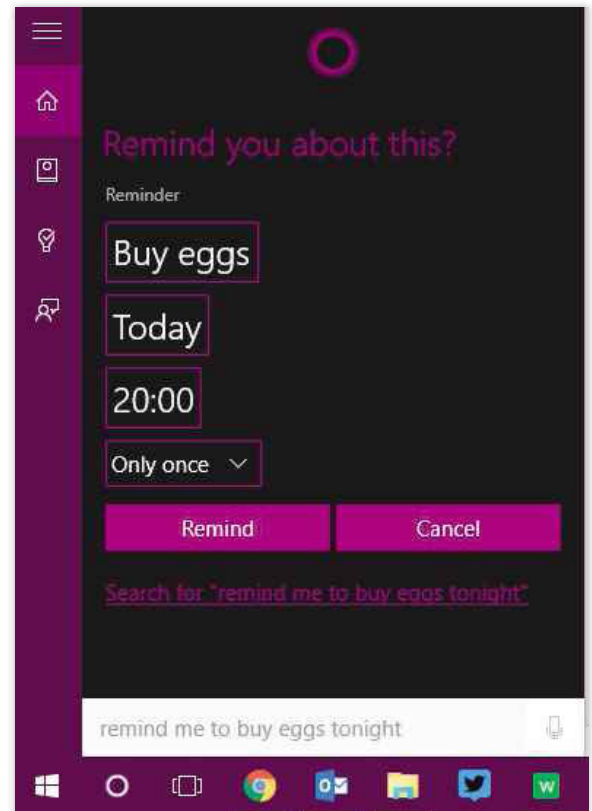
Quickly set a reminder with Cortana

Cortana's natural language processing is surprisingly effective when it comes to setting reminders. Simply say, or type, a phrase such as 'remind me to buy eggs tonight' and Cortana will create a reminder.

Fix a broken Cortana

You might find that Cortana doesn't work for you, especially if you're upgrading an old PC or laptop. This is because of a strange bug that makes Windows 10 say that Cortana isn't available in your region or language. Cortana is definitely available for the UK, so it can be puzzling. Happily, it's not too difficult to fix.

First, press the Windows key, type 'Region & Language' and open up the corresponding Settings option. Select 'English (United Kingdom)' and go to Options. Now click Download under both Speech and Language Pack. After they've both downloaded, restart your computer.

If the above doesn't work, head into the Region & Language settings and add English (United States) as your language and download the corresponding Speech and Language Packs and set Cortana up. Once it's working you can go back and change everything back to English (United Kingdom) and everything should work.

Cortana not working? Changing the Region settings can bring it back to life

➡ Cortana is named after a character from *Halo*

Change how Windows 10 looks

As Microsoft's newest OS, Windows 10 looks good and has lots of customisation options. Dip under the surface and you'll find some hidden themes that give you even more control

WINDOWS 10 GENERALLY looks brilliant, but some people find that the grey backdrop used for many of Windows 10's menus is a little hard on the eyes. Unfortunately, this is one option that you can't override, with the other colour options not offering any better contrast. However, there are some hidden settings, which we'll show you how to access to turn on the special dark theme.

Turn on Windows 10's hidden dark theme

Nestled deep inside Windows 10's Registry is a way to turn on a hidden 'dark' theme that's a little easier on the eyes than the standard grey backdrop used for many of Windows 10's menus. Make sure you follow the instructions below carefully and don't change anything else. It's wise to backup your computer first.

Open the Registry Editor by doing a search for 'regedit' in the Start menu. Hit 'Yes' on the User Account Control screen that pops up. Navigate through the nested list of folders on the left-hand pane to get to 'HKey_Current_User\Software\Microsoft\Windows\CurrentVersion\Themes\Personalize'.

⬆ The hidden dark theme gives you better contrast in menus and some apps

Nestled deep inside Windows 10's Registry is a hidden 'dark' theme that's easier on the eyes

Once you're in the correct folder, right-click in some empty space in the right-hand pane and choose DWORD (32-bit) Value from the New menu. Name this 'AppsUseLightTheme'.

Now right-click the new entry that appears and select Modify. Check that the Value Data entry is set to 0. Restart your computer, and you'll have the dark theme set. If you want to go back to the standard theme, head back into the

⬇ The Edge browser has a dark theme, too
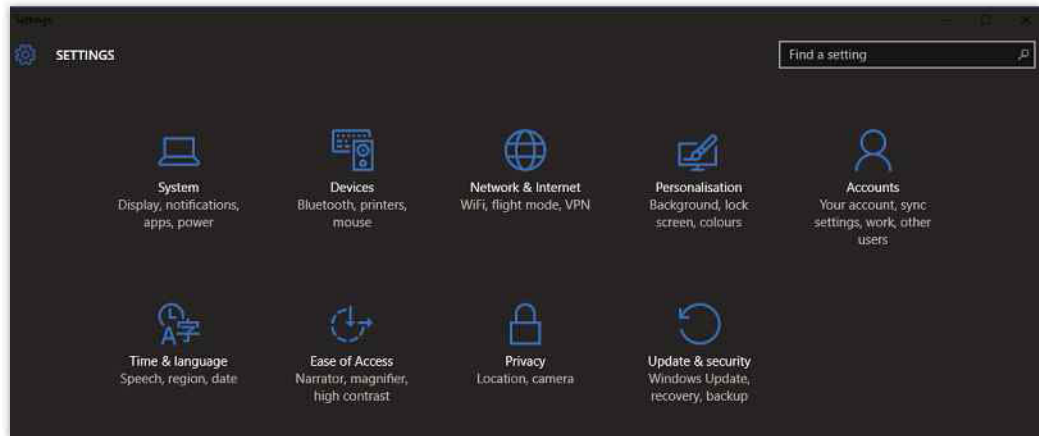
Registry Editor and change the AppsUseLightTheme Value Data entry you made to 1 or simply delete the AppsUseLightTheme entry you created.

Give Microsoft Edge a dark coat of paint

If you use Microsoft's Edge browser that comes pre-installed with Windows 10, you can give this a dark coat of paint as well. All you need to do is open up the settings (the three-dot menu at the top right) and select Dark under 'Choose a theme' at the top of the settings pane. You might find this is a lot easier on your eyes than the default light theme.

High contrast theme for everywhere else

While the dark themes for settings and Microsoft Edge are, in our view, the most attractive, there are also a number of different High Contrast themes built into Windows 10 for everything else. Click Start, type 'High Contrast' and select High-contrast settings.

You're then presented with a few different high-contrast themes. These make it easier to read text and see icons, but they don't make Windows 10 look particularly attractive, as they're designed for those with vision difficulties.
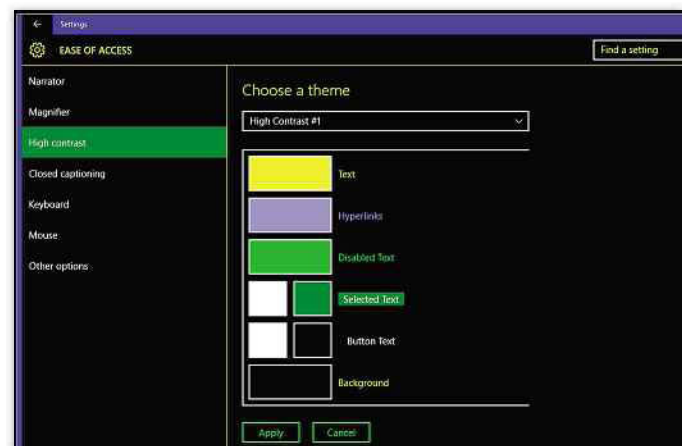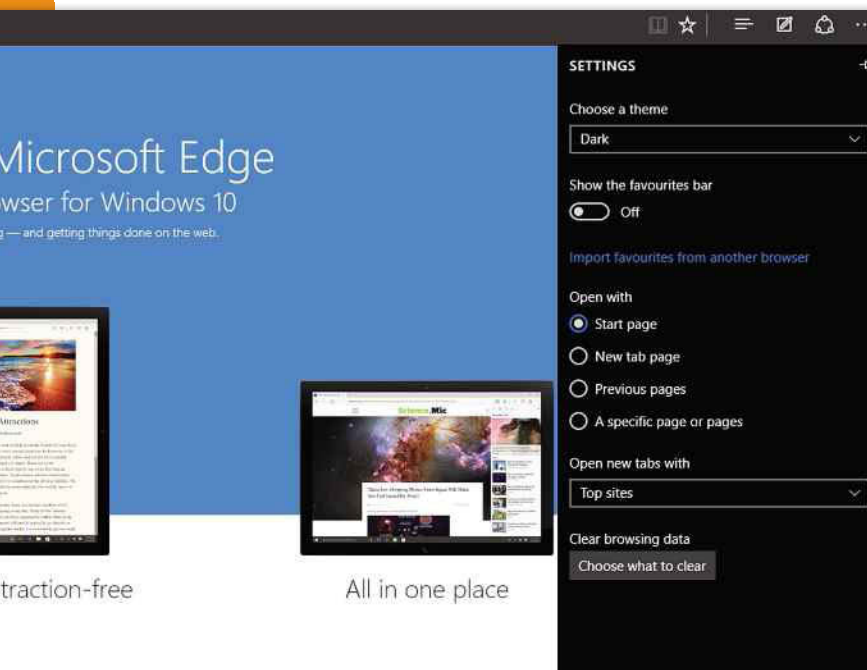
⬆ If you have trouble reading what's on screen, the Windows 10 high contrast mode can help

Make Windows 10 work for you

Windows 10 has lots of great new features, but sometimes they get in the way of what you want to do. Here's how to fix some of the major issues that might annoy you

WINDOWS 10 IS a brilliant operating system that introduces lots of new features. While most of them are great, some just tweak the way that old features worked, which can be really annoying. If you've got used to working one way in Windows and don't like some of the newfangled tricks, here's how to change them.

Disable Windows Snap Assist

Windows Snap made its debut all the way back in Windows 7, providing a quick and easy way to resize windows and arrange your screen when you had multiple windows open. Just click and drag a window to the side or corner of the screen and it will lock in and automatically resize.

With Windows 10, Microsoft has taken this a step further with Snap Assist. Now when you drag a window to the edge of a screen (or use Windows + an arrow key) so that it covers half of your screen, you'll get thumbnails of other open applications to snap to the other side. This is great if you have a high-resolution monitor and want lots of windows open all at once. Not everyone likes Snap Assist recommending what to use for the other side of the screen, though, so fortunately it's easy to disable.

First, open up the Settings application and select the System option, then the Multitasking option in the list on the left. You can now disable the toggle for 'When I snap a window, show what I can snap next to it', to turn off the Snap Assist feature. With the other two toggles you can also turn off Snap altogether or stop it from adjusting the size of windows.

Turn on God Mode

Digging through the Control Panel settings can be a laborious job. That's where Windows 10's 'God Mode' can come in handy. This was in fact introduced in Windows 7 but we were pleased to see it remains with the latest version of Windows. God Mode puts all of Control Panel's settings in one long list, making it much easier to navigate.

First, right-click your desktop and select New, Folder. Name the folder 'God Mode.{ED7BA470-8E54-465E-825C-99712043E01C}' (without

➡ Want to see all of Windows 10's settings in one list? You need God Mode
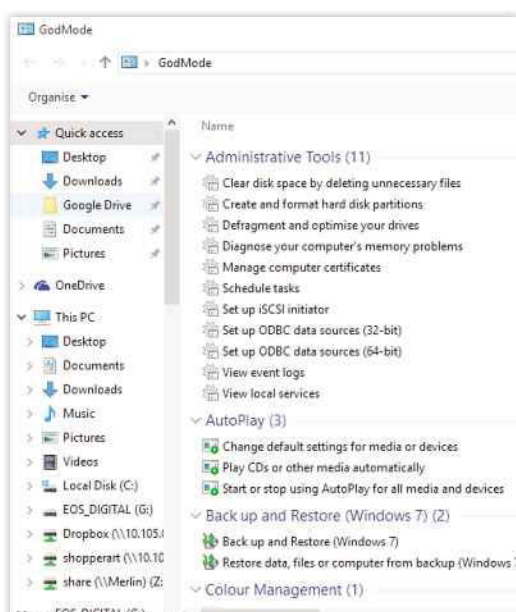
⬆ Windows 10's Snap Assist function is handy for some, painful for others
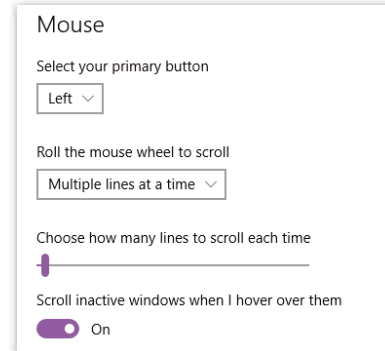
⬅ If you prefer having to click on a window to start scrolling, turn off Inactive scroll

⬆ You can make Snap act more like it did in Windows 7 and 8

the quotation marks). After you click out of the text box, the folder will change to a Control Panel shortcut named God Mode. You can actually change the God Mode text above to anything you want, but God Mode seems an apt description.

Double-click the icon and you'll be presented with the God Mode list of infinite power. All the settings are organised under the corresponding header, such as 'Sound' and 'Programs and Features'.

Background scrolling

With Windows 10, you no longer have to 'focus' on a window by clicking it in order to scroll. By default, hovering your mouse over a window is enough to be able to start scrolling using your mouse wheel or touchpad gestures. This is great if you have multiple windows or monitors and need to work in one window while scrolling the other. A new option under the Mouse menu (Settings, Devices, Mouse & touchpad) called 'Scroll inactive windows when I hover over them' can turn this off.

Print natively to PDF

New in Windows 10 is the ability to 'print' to a PDF without installing any third-party software. You should have a 'Microsoft Print to PDF' option listed under your printer options whenever you want to print anything. You can then choose where to save the PDF.

105

Fix OneDrive

Microsoft's cloud storage, OneDrive, is an integral part of Windows 10, but it's missing a few features of the old Windows 8 app. Here's how to get them back

ONEDRIVE IS MICROSOFT'S cloud storage platform, a rival to the likes of Google Drive and Dropbox. One of the great features of OneDrive on Windows 8 was its 'placeholder' approach to file access. Instead of syncing content you had stored in the cloud to your local device storage, a placeholder file was stored, which was smaller than the real file stored in the cloud. This made File Explorer look and act as if you had the file stored locally, but would in fact download it when you needed it.

Placeholders were particularly useful for those with limited amounts of local storage, such as ultra-portable laptop or tablet users. You could have 32GB of local storage but 100GB of files saved on OneDrive, and your tablet would still be able to see all your OneDrive content and only download what it needed. This was apparently confusing for users, who assumed they had all these files stored locally, and became a problem when anyone tried to access the files without an internet connection. Microsoft therefore decided to remove placeholders and instead introduce selective syncing, meaning folders were saved to local storage from the cloud, much like Dropbox and Google Drive.

For those of us who were perfectly happy with how placeholders worked, there's a workaround to bring it back, although it does take a little effort and it has a one OneDrive account limitation. First you need to go to the OneDrive page in your web browser and sign in. Then go to 'Files' and open up any of your folders. You want to copy your unique ID which comes between '?id=' and '%' in your address bar. It should be 16 characters in length.

Open up File Explorer and go to This PC. Under the Computer tab select Map Network Drive. Type in 'https://d. docs.live.net/' (with no quotation marks) and append your ID. Make sure you tick both boxes for 'Reconnect at sign-in' and 'Connect using different credentials'. Hit Finish and
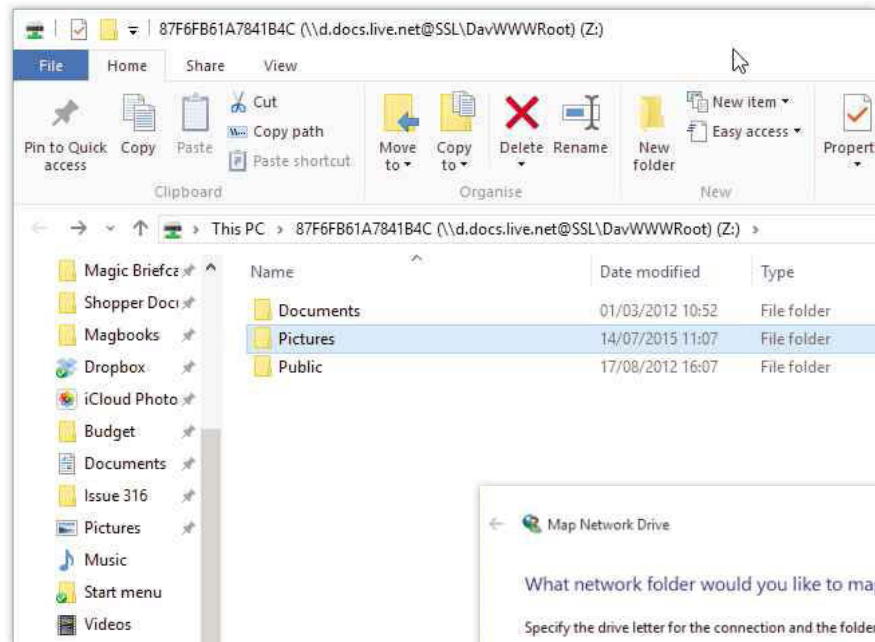
You need to map a network drive to your OneDrive account if you want placeholders back

Your mapped drive looks and acts like a real drive, although files are stored online
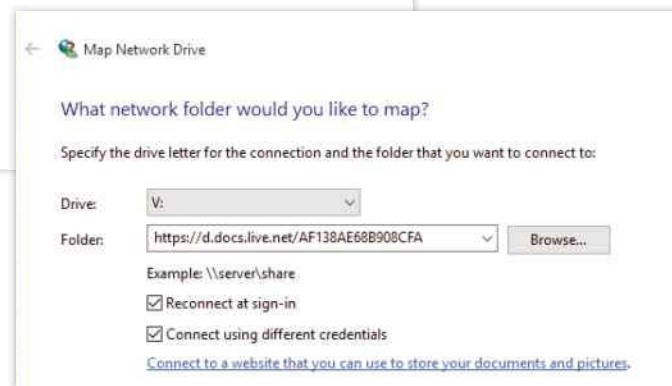
Windows will attempt to connect to the server. It will ask you for your OneDrive username and password. Enter these and tell it to remember your credentials if you want.

A new folder will appear as though it were local storage, and you'll have a new drive under This PC, with your OneDrive ID as its name. You can rename this to anything you want by right-clicking the drive name under This PC and selecting Rename. Call it something easy to recognise such as OneDrive. Now, when you access this network drive, you're only accessing files that are kept online, not on your hard disk. Any file you try to open will be downloaded from the internet first.

You'll need to copy your OneDrive unique ID from your browser's address bar

Capture video using the Xbox app

If you need to record a video of an application, perhaps to show someone how to use a feature, you can do it for free using a built-in feature

SOMETIMES IT'S USEFUL to be able to capture video of what you're doing on your computer, such as to create an application tutorial video. In the past, this meant installing dedicated screen capture software, but Windows 10 has a slightly secret way of easily capturing video using the included Xbox app by tricking it into thinking you're recording gaming content (its intended use).

It has its limitations, however, as you're only able to capture from one open window. Minimising whatever you're doing will stop recording and save it, but if you're only working in one application it's a quick and easy way to make a recording.

First, open up the Xbox app by either finding it in your tiles or just by searching for 'Xbox'. You'll need
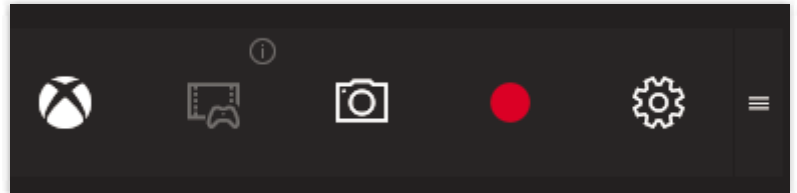
↓ Tell the Xbox app that you're loading a game and it will record anything

↑ You'll see this recording symbol when the Xbox app is working

to leave this running in the background. With the application you want to record open, hit Windows-G on your keyboard to open up the Xbox app's Game bar. You'll need to tell a little fib and tick the box that says, 'Yes, this is a game'.

The Game bar will now pop up with controls. You can either hit the camera icon to capture a screenshot or the red record button to begin recording video. Hop back into whatever application you want to record and you'll notice a recording symbol in the corner to show it's recording. Hit Windows-G when you're finished to bring the Game bar back up and hit stop. Videos are saved to C:\Users\[username]\Videos\Captures by default.

Would you like to open Game bar?

☐ Yes, this is a game.

Essential Windows shortcuts

CTRL + Z	Undo last action, includes deleting and renaming files and folders
⊞ + ←	Maximise app to left half of the screen
⊞ + →	Maximise app to right half of the screen
⊞ + ↑	Maximise current app
⊞ + SHIFT + ↑	Stretch window to the top and bottom of the screen
⊞ + ↓	Minimise current app
CTRL + SHIFT + ESC	Open Task Manager
⊞ + D	Minimise all windows and show the desktop
⊞ + L	Lock your computer
⊞ + X	Open hidden system menu

Essential Windows 10 shortcuts

⊞ + A	Open Action Centre
⊞ + S	Open search
⊞ + C	Open Cortana in listening mode
⊞ + O	Lock the device orientation
⊞ + ⇥	Open Task View
⊞ + CTRL + D	Add a virtual desktop
⊞ + CTRL + ← →	Switch between virtual desktops
⊞ + CTRL + F4	Close your current virtual desktop
⊞ + I	Open the Settings app

Make Windows 10 more power efficient

Whether you want your home computer to use less power or your laptop to last longer, Windows 10's power-saving options are a powerful way to control your PC

WINDOWS 10 HAS some pretty clever power-saving settings, primarily designed to extend the battery life of your laptop. However, there's more that you can do to save power, whether you have a laptop or a desktop PC.

1 Shut down your computer rather than using sleep

Now that Windows 10 can boot up faster than ever, have Windows 10 shut down your computer rather than putting it to sleep when you hit the physical power button. Do a search for 'Power options' in the Start menu and then select 'Choose what the power buttons do'. Have it shut down your computer when on battery power. You can also select Shut down from the menu that appears when you click the Start menu's power button.
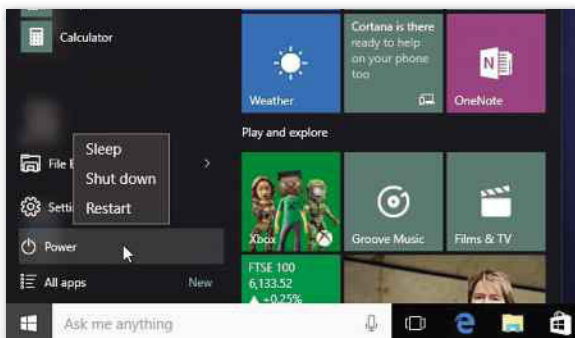
2 Use Windows Store apps when possible

When you use apps from the Windows Store, they get suspended by Windows 10 when they're not in use and idling in the background. This means they're not draining resources and, therefore, battery life when not in use. This is in contrast to regular desktop applications that sit there in the background sapping away vital battery life.
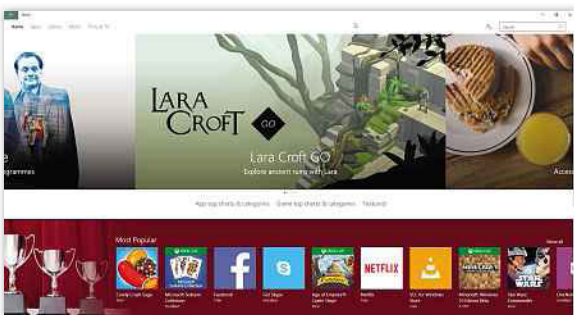
3 Use Windows 10's battery saver mode

Battery saver mode reduces internet and hard disk usage when your battery drops below 20% (you can change when this kicks in – just search for 'Battery Saver' in Cortana). You can also use it to decide what Windows Store apps are able to run in the background to keep a tighter rein on your battery usage. This option is only for laptops and is not available on desktop computers without an integral battery. For more on battery saver mode, see our guide on page 112.

4 Adjust your Power & Sleep options

While your computer and display are on, they're drawing power, so you should set them both to turn off automatically. Go to Settings, System and click on Power & sleep. Using the drop-down menus, you can choose the time-out for when your monitor turns off and when your PC goes to sleep. You might have to tweak your settings if you find that your computer or display switch off too frequently.

If you click Additional power settings you get into the old-style Power saving options, which give you much finer control over your computer's power usage. Most people won't need this level of control, however.
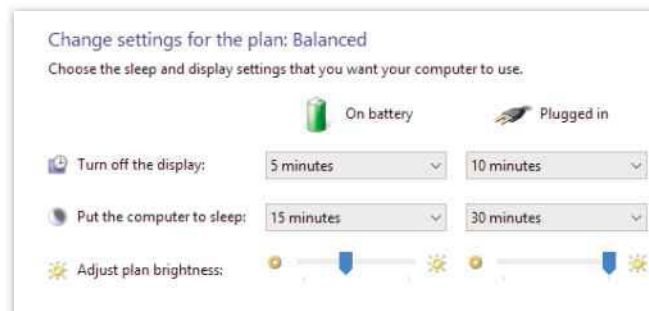
5 Shut down applications you're not using

Desktop applications can use processing power all the time, so make sure you've shut down any that you're not using. This also goes for additional browser tabs: each one open is using resources, which means you're using more power. You can see which applications are currently resource hogs by opening up Task Manager (right-click the taskbar

Desktop apps use processing power all the time, so make sure you shut down any you're not using

and select Task Manager). Click More details and then click Processes. If you click CPU you can see, in real time, which applications and services are using the most processor time. Shut down any recognisable applications that you're not really using and that are using a lot of your CPU's time; anything you don't recognise as an application is most likely a system process and should be left alone.

Change how you log into Windows 10

Why use a password when Windows 10 has alternative options that are just as secure? We show you how to change the way you log in

PASSWORDS HAVE BEEN the standard way of logging into Windows computers for years, but they're not necessarily the most secure way: we often pick weak passwords that we can remember easily. For that reason, Windows 10 has introduced the PIN sign-in option, which lets you log in securely and quickly using a number, rather than a password.

Use a PIN instead of a password

You've been able to use a PIN number to sign into Windows since Windows 8, but previously it was limited to only four numbers. Now, with Windows 10, you can create a far stronger PIN, making it a more secure and convenient method than dealing with passwords.

Open up Windows 10's Settings application and select the Accounts option. On the Accounts screen, select 'Sign-in options' on the left pane. Under the PIN section, select Add. You might be asked to enter your Microsoft Account password at this point. The next screen will let you enter your PIN: this can be as long as you want, but just make sure you remember it.

Remove your PIN

If you decide you would rather not use a PIN and prefer your traditional password, you can choose to remove the PIN from your account. Unlike Windows 8 where there was a specific 'Remove PIN' option, it's not obvious how to do this in Windows 10, but it is possible.

With Windows 10, you can create a far stronger PIN, making it a more secure and convenient method than dealing with passwords

On the Accounts settings screen as above, select 'I forgot my PIN'. On the next screen hit Continue. Again, you might be asked to enter your traditional Microsoft Account password to proceed. Then, on the next screen, you'll see the new PIN entry screen you saw when initially setting up your PIN. Leave both fields blank and simply hit 'Cancel' to exit this screen. Your PIN is now removed from your account and will no longer be a sign-in option.
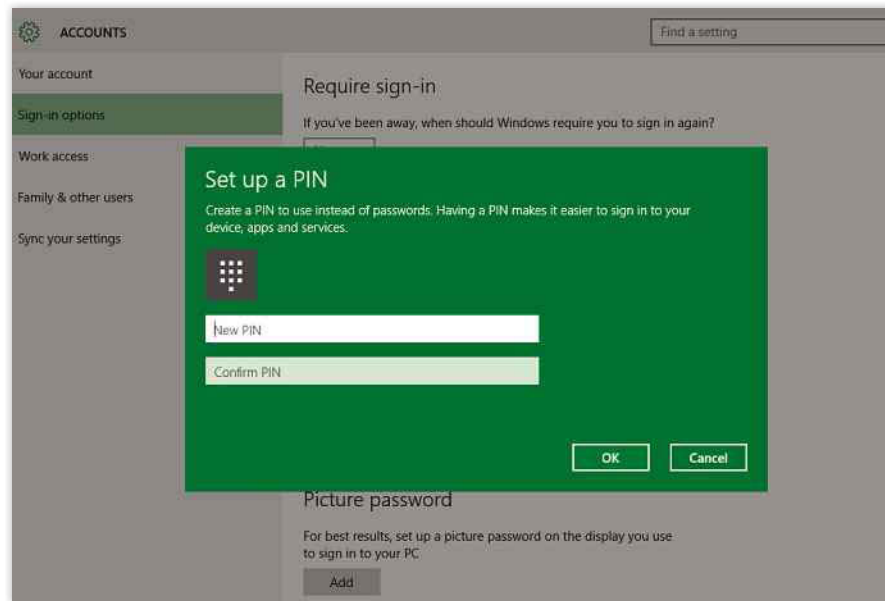
⬆ It's easy to create a PIN to log into Windows 10

⬇ If you no longer want to use a PIN, you can remove it

Are you sure?

This isn't something you'll want to take lightly if you use your PIN in several places. If you use your PIN to access games, social networking or financial institutions, you'll need to log in from scratch to each of these places after you've reset your PIN.

It's also possible that resetting your PIN could result in data loss if you have content managed by your company or organisation.

What is the square on the sign-in screen?

If you're using Windows 10 on a touchscreen device or a tablet, you might have wondered what the little square icon next to the '0' was when entering a PIN number. It's actually a toggle that disables the visual feedback you get when tapping the onscreen keyboard. With it turned on, the colour of the key you tap changes colour.
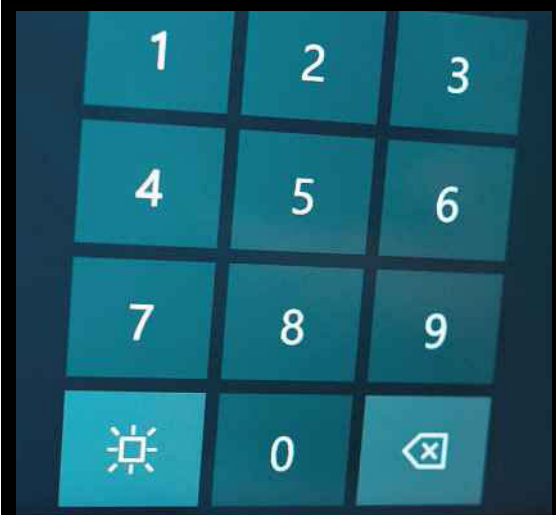
⬆ The square next to the zero toggles the visual feedback on the onscreen keyboard on and off

Set up Windows 10's family features

If your kids are using your computer, you can set up special accounts for them so that you'll have more control over what they can and can't do online

IF YOU WANT to let other members of your family use your Windows 10 device, it's easy to set up special user accounts, complete with easy management to allow or block users at any time. Adding children to your account will also let you view reports on their activity online and limit their use, such as how long they spend online. The process for adding both kids and adults to your family account is incredibly easy.

From the Accounts screen of the Settings application, navigate to Family & other users from the left-hand pane. Click the 'Add a family member' option. The next screen will let you choose to add either a child or an adult. Adding a child gives you monitoring capabilities for their activity. Anyone you add will need to have a Microsoft Account, so enter their respective email address in the field. If they don't have a Microsoft Account, you can create one for them. An invitation will then be sent to the user you are adding. They'll need to confirm by clicking a link in their email. If you've set up an account for a child, you might have to do this for them.
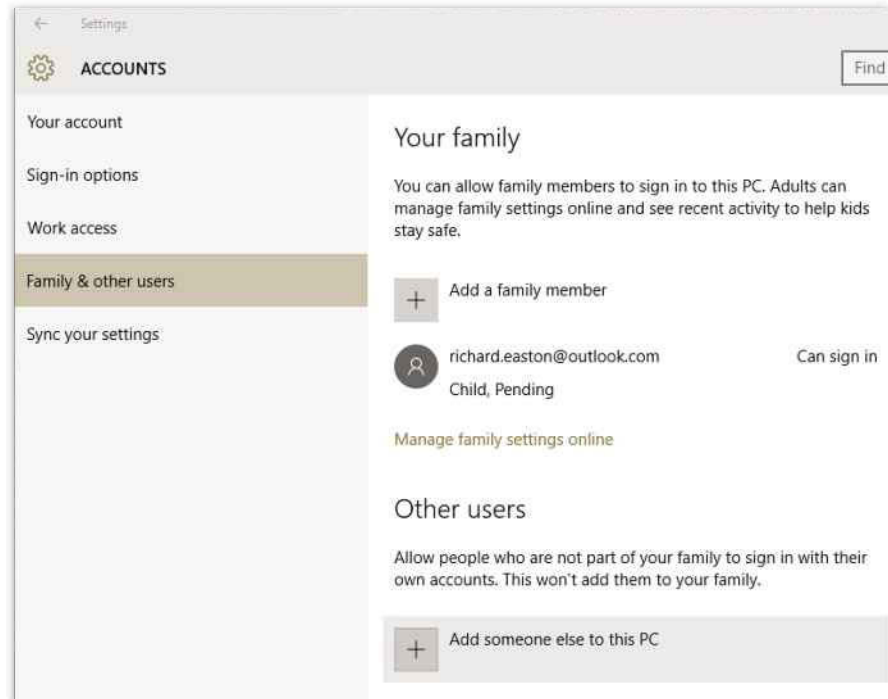
↑ Windows 10 will tell you which accounts are still pending activation

↑ Windows 10 will ask what type of account you want to create

The new user will then appear under the 'Your family' section of the Accounts settings page, where you can see the current confirmation status. This gives you the option to chase up anyone that hasn't signed in or confirmed their account. Select any user account and you can click the Block button if you don't want them to have access to your computer any more. You can also use the 'Change account type' option to make the account an adult rather than a child, which is useful as your children grow up.

As the administrator, you can monitor and change settings for family members from the browser-based control panel (*account.microsoft.com/family*). You can even have weekly activity emails sent to you so you can have an overview of your kids' computer activity. You can click the Block link to choose what your child can and can't see online, too.
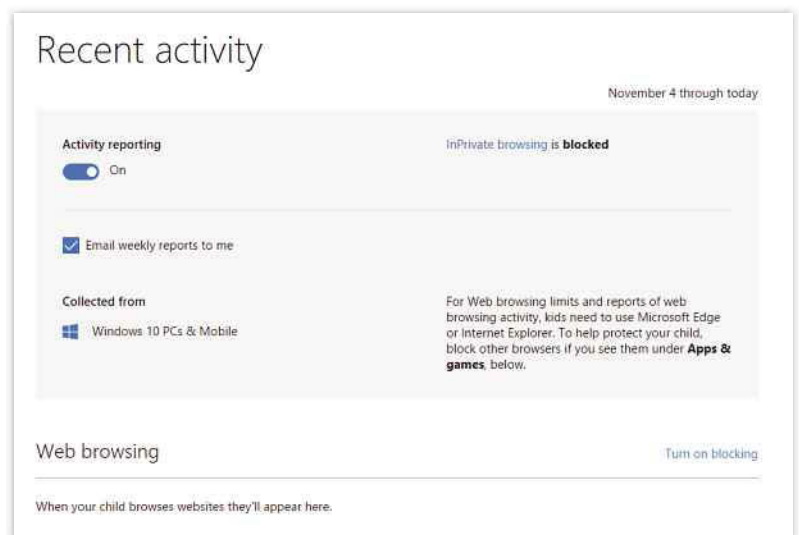
↑ You can see what your kids have been up to online and even block them from seeing certain websites

As the administrator, you can monitor and change settings for family members from the browser-based control panel. You can even have weekly activity emails sent to you

Manage Windows 10 updates

Microsoft has changed the way that updates work. With our help you can get the latest updates first and save on internet bandwidth

THE WAY IN which updates are delivered in Windows 10 is considerably different from previous versions of Windows. While they're generally more reliable, you may find that the new system is using more bandwidth and you're not getting the latest updates. Here's how to fix everything.

Save bandwidth

Updates are rolled out more regularly but also in a different way. Now, updates are delivered peer-to-peer (P2P), meaning when an update is downloaded to one of your systems, it can be shared with other PCs on the same network. This saves both you, and Microsoft, bandwidth, as you don't needlessly download it more than once.

However, Microsoft has been sneaky and by default this is set to share updates through P2P both with your local networked PCs but also with others over the internet, in a similar way to how BitTorrent works. This means that your upload bandwidth is being used as part of Microsoft's update network, which could mean slower internet speeds for you. Here's how to turn it off.

From the Settings application, go to the Update & security option or just do a search for 'updates' in the Start menu and select Check for updates. From the next screen, select Choose how updates are delivered.

Here, the top option turns off P2P altogether if you don't want to share updates with anyone. There's no real need to turn this off. Instead, turn your attention to the radio buttons below. Select the top option, 'PCs on my local network', to stop Windows updates being shared across the internet to conserve your bandwidth.

⬆ Read the Insider Updates warning carefully and only continue if you're happy to do so

Insider builds, including the fact that you're opening your computer to pre-release software, which might break things. Hit Next if you're happy with the warnings.

The next screen warns you that if you choose to stop receiving Insider builds you might have to fully restore your system, which means losing everything. Hit Confirm if you're happy with this. The next step is to restart your system. You can either do this now or wait for a more convenient time.

After a system restart, return to the Windows Update settings page and you'll see an option of receiving Fast or Slow updates. This puts you on different update tracks, with the Fast track meaning you get more regular updates.

⬆ You can stop Windows 10 sharing updates from your computer with others on the internet

Get Windows 10 updates faster with Insider builds

The Windows Insider Program is how Microsoft tests out the latest features before they're rolled out to the general public. Of course this could mean the occasional bug, but builds released to Insiders are generally stable. Insiders get the chance to provide feedback to Microsoft to help shape the operating system down the line. Signing up can be done from the Updates settings page.

Go to the Settings, Update & security settings page. Under Get Insider builds hit Get Started. You'll see a warning screen letting you know the possible disadvantages of

Free up space after a Windows 10 upgrade

Occasionally Microsoft will update your Windows 10 installation to the latest version. When this happens, your previous Windows installation will remain on your hard disk in case you have problems and want to go back to the previous version.

However, this can take up to 20GB of space. If you're happy with the upgrade, you can delete these files. Open the Start menu and search for Disk, then select Disk Clean-up from the search results. Select the Windows 10 (C:) drive in the box that appears, and click OK. Now click the Clean up system files button, select your C drive again and, in the window that appears, tick the Previous Windows installation(s) box and OK. You will now be asked if you want to permanently delete these files, so if you definitely don't want to go back to your previous version of Windows, click Delete Files.

⬆ Wipe out old installations of Windows 10 if you want to reclaim some disk space

Get more battery life from your Windows 10 laptop

Can Windows 10 help boost your laptop's battery life? We test Battery saver mode to find out

WINDOWS 10 PROVIDES many benefits over previous editions of the operating system, but improved battery life probably isn't one of the main advantages you'd think of. However, Microsoft has done a lot of work with its battery-saving technology, making your laptop more efficient and last longer. The main setting, Battery Saver, is enabled by default, so you don't have to do anything, but in this article we'll show you how to change Windows' battery options and reveal how upgrading to Windows 10 affected battery life on our test laptops.

Battery saver

The first place to start is Battery Saver, a new option in System settings. It's designed to lower screen brightness, reduce background activity and stop push notifications when your battery hits a certain point (20% by default), reducing the load on the battery. While the defaults are good enough for most people, you can control the settings in more detail.

To access it, click the Start menu, type Battery Saver and choose the option that appears. You'll see the Battery Saver dialog box, which gives you an overview of your laptop's battery life, including the remaining percentage and the estimated time remaining.

Battery use

You can click the Battery Use link to take you to a screen that shows you what's been eating your battery life up. From this screen you can see how much time was devoted to the main laptop components: System (CPU, hard disk, apps and so

⬆ The Battery Use app tells you what's using the power on your laptop

on), Display and Wi-Fi. This is useful information, as you may want to turn down your display brightness by default if it's using a lot of power, for example. Next, you can see a list of applications and how long they've been in use. This is represented as percentage of total application use, not percentage of battery use.

Click any app in this list and you can click Details to drill down and get more information, including how much System, Display and Wi-Fi time that app has been using. There's also a block to tell you how much time the app has been consuming while in use (in the foreground) and how much time it has been using in the background working away. Depending on the app, you can use the sliders to control whether it can run in the background and if it's always allowed to run in the background, even when Battery Saver is enabled. Only full-screen Windows 10 apps (not standard Desktop applications) have these options, and even then, the options are limited to only some apps.

To see more easily which apps can run in the background, go back to the Battery Use dialog box and click the Change background apps settings. You can now view all the apps that can run in the background and use the sliders next to their names to allow or disallow this feature.

Battery saver settings

Back on the main Battery saver screen, you can toggle the mode on and off, using the slider if you want to enable it manually, but unless you know you're going to spend a long time away from a power socket there's little reason to do this. To make more

Showing battery use from the last:

24 Hours

System: 1.4%
Display: 98.1%
Wi-Fi: 0.4%

In use: 100.0%
Background: 0.0%

◀ Find out how much power an individual app has been using

➡ Battery saver is a new technology in Windows 10 that reduces the load on your laptop's battery automatically to help increase battery life

advanced tweaks to the settings, click the Battery saver settings link at the bottom of the page.

In this dialog box, you can choose to enable Battery saver automatically and choose the battery percentage when the feature is activated. The default setting of 20% should suit most laptops, but if your battery lasts a long time anyway, you may want to drop this to 15% or 10%; conversely, if your battery doesn't last very long, you may want to increase the setting to 25% or 30%.

The default setting blocks apps from pushing notifications (eating processor and battery time), but you can override this in the 'Allow push notifications' box, although we don't recommend doing so. Your laptop's screen is a massive drain on the power of your laptop, so lowering its brightness can help improve battery life. For that reason, it makes sense to tick the 'Lower screen brightness' option, so your laptop will automatically dim the display when Battery saver turns on.

Finally, if you have an app that absolutely must run in the background and that you want notifications from at all times, you can use the 'Always allowed' section to allow this. Click the Add app button to see a list of apps you can add to the section; only full-screen apps (not traditional Desktop applications) that support Battery Saver are listed: the Edge browser is an option, but Chrome isn't, for example.

Power & sleep

Go back to the main Settings app and click on Power & Sleep to access the more traditional power-saving options. From this app, you can choose how long your laptop is inactive
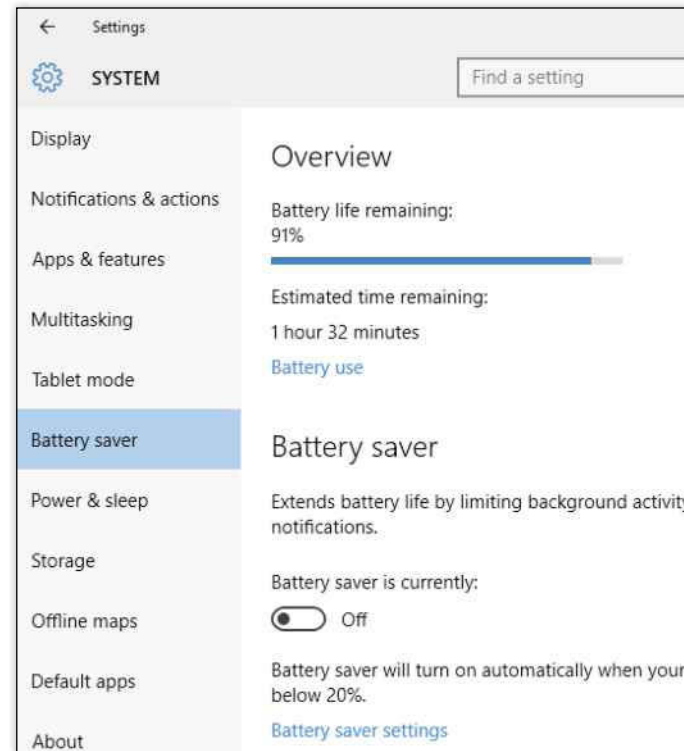
before its screen is turned off and when it should go to sleep. There are separate options for when it's plugged in and when it's on battery power. For most people, the default settings should be fine, but tweak them if you find that your computer is powering down too frequently.

You can click Additional power settings to open up the old-fashioned Control Panel's Power Options settings (one of the few things Windows 10 hasn't quite integrated into the new apps). These settings let you choose or create a power plan, which is a set of defined settings that set how your laptop works. Balanced is the default plan; click Change plan settings to see what it does. The basic settings are the same as in Power & Sleep, only you can also set a default screen brightness.

There's also an option called 'Change advanced power settings', which includes some really advanced settings, including controlling how the processor works. We'd advise you to steer clear of this section unless you really know what you're doing, however. ▣

What does Windows 10 do for battery life?

To find out if the new Battery Saver mode can help boost battery life, we tested three old Windows 8.1 laptops before and after we upgrading them to Windows 10.

With two of our laptops we were impressed to see that battery life improved after upgrading to Windows 10, not just by a little but by a full 80 minutes in the case of the Acer Aspire E111. The Dell Inspiron 17 managed a more modest 20-minute improvement, while the Acer Aspire V5 actually lost 24 minutes of stamina.

These results are in line with the anecdotal information we've seen, with some users complaining of significantly reduced battery life with Windows 10, while others reported no significant change.

It's worth running your own tests at home, perhaps playing a video and seeing how long your laptop lasts with and without Battery Saver mode enabled by default to see if your battery life improves or decreases with this mode enabled.

Windows 10 ▮
Windows 8.1 ▮

Dell Inspiron 17 — 3h 29m / 3h 9m
Acer Aspire V5 — 3h 28m / 3h 52m
Acer Aspire E111 — 6h 31m / 5h 11m

0h 1h 2h 3h 4h 5h 6h 7h
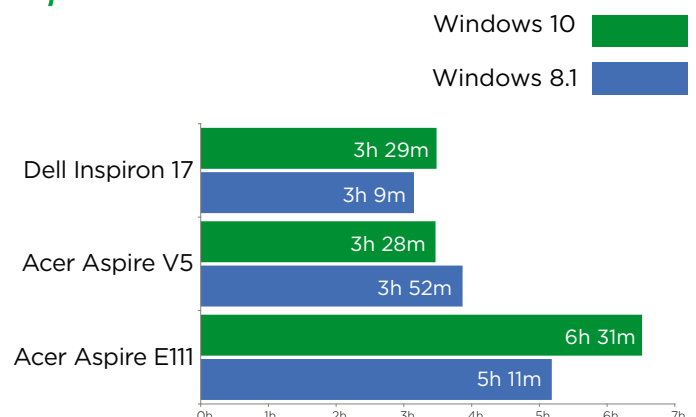
Which **FREE** TV service is best for you?

Free TV used to be simple: there was one way to get it. Now with loads of different services available, the choice is more confusing. We're here to help you make the best decision

Until a few years ago, choosing a TV service was easy. You'd either go for the default free option, which you'd receive through your regular TV aerial, or pay for Sky or Virgin Media's services and get dozens of extra premium channels. Today the situation is rather different, and even those who only want free TV have lots of competing services and technologies to choose from. In fact, there are arguably a few too many, with five main services, plenty of big-name players and hundreds of devices on the market. At the moment, Freeview and Freesat provide basic TV, while YouView, Freeview Play and Freetime offer

regular TV with on-demand services. On top of that, you can watch many free channels online without the need for any additional hardware. They all offer a similar base level of service, although their differences are revealed when you look at the more advanced internet-based features. Here, we'll show you how to choose the most appropriate service for your needs and highlight any upcoming changes. We'll start with the differences in service.

Broadcast TV (Freeview and Freesat)
There are two ways for viewers in the UK to receive live broadcast TV: Freeview and Freesat. Even the more

advanced platforms, such as YouView and Freetime, use one of these services. Your first choice, then, is whether to go with Freeview or Freesat.

Both services are digital and require you to have a Freeview or Freesat receiver – either built into your TV or inside a set-top box or PVR hard disk recorder. Both carry largely the same number of channels, but the difference is in how they're transmitted. Freeview uses a terrestrial signal and is received using a standard aerial connected to your TV or set-top box through a coaxial cable. Freesat is transmitted by satellite and requires a dish to receive. Any old Sky dish will do the job if you have one. Other than that, Freesat is the better choice if you live somewhere with poor aerial reception.

The most basic Freeview and Freesat provision is broadcast in standard-definition (SD). If you want high-definition (HD) channels you need an HD TV or set-top box with a built-in Freeview HD or Freesat HD receiver.

Again, the range of channels available is very similar, with Freeview HD offering 12 HD channels, while Freesat HD has 11. Both provide HD versions of the most popular channels, including BBC One HD, BBC Two HD, BBC Three HD, BBC Four HD, ITV HD, Channel 4 HD and BBC News HD. The differences lie in the minor channels on offer: Freesat broadcasts Russia Today HD, for example, while Freeview has Al Jazeera HD. The channel line-up changes from time to time, so it's worth checking the most up-to-date lists from Freesat HD (*www.joinfreesat. co.uk/freesat-channels*) and Freeview HD (*www.freeview.co.uk/what-we-offer/ freeview-hd*).

Freeview has announced that from 1st January 2016, televisions larger than 32in in size will have to contain HD receivers to carry Freeview branding. Any new Freeview devices, such as set-top boxes, will also need to be HD-capable after 31st December 2016.

What about recording?

If you want to record TV programmes and you intend to use only basic free TV, you need a Freesat+ HD or FreeviewHD Recorder (previously
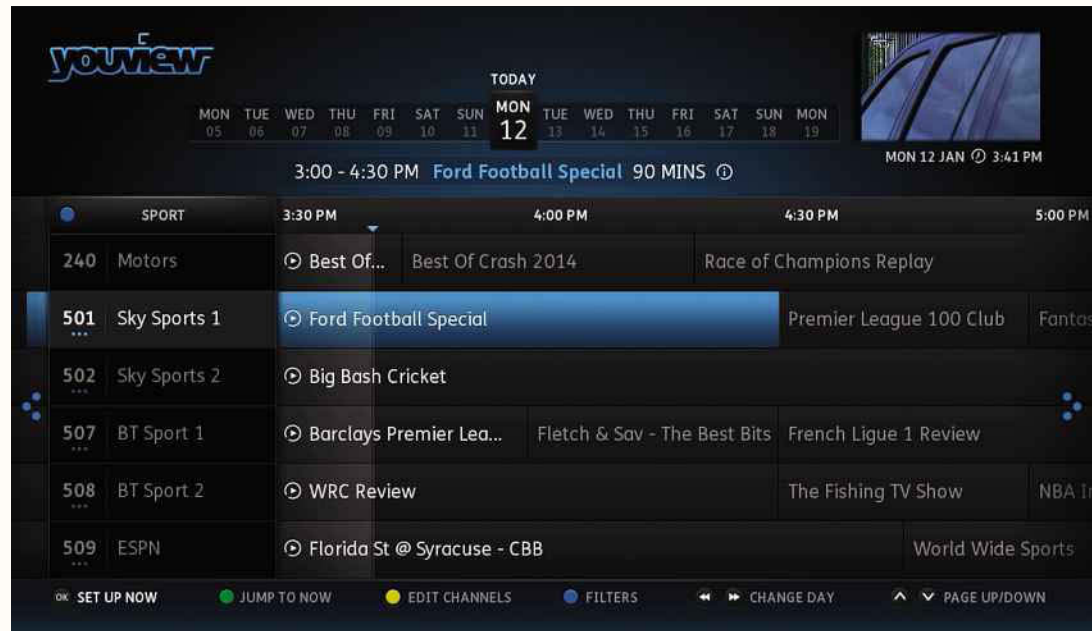
↑ Depending on how you receive your service, you can add premium channels to YouView, such as Sky Sports

known as Freeview+ HD) PVR. Be careful you don't buy an older Freesat+ or Freeview+ box, as they don't support HD channels. Both types of box let you record entire series and pause live TV.

To record more than one TV show at a time (or record one while watching another), you need a PVR with multiple tuners. For a FreeviewHD Recorder this is easy to set up, as you only need a single aerial connection for one, two or

For high-definition channels you need an HD TV or set-top box with a built-in Freeview HD or Freesat HD receiver

more tuners. What's more, Freeview channels are broadcast in multiplexes, which means multiple channels are bundled into a single broadcast. This means some boxes can record two channels from the same multiplex using only one tuner, leaving a second tuner (or more) free for you to record or watch something else.

With Freesat+ HD, you need one cable for each receiver, which runs to

an individual Low Noise Block (LNB) on your satellite dish. The LNB receives the microwave signal from the satellite, amplifies it and converts it to a low-frequency signal that's sent down the cable. To tune in to different channels, the receiver must be able to control the LNB, which is why you need one cable per receiver – you can't just use a satellite splitter.

This restriction means it's easier to install a FreeviewHD Recorder in most homes than a Freesat+ HD box. In addition, a much wider choice of FreeviewHD PVRs is available.

SMART TV

On top of the basic TV services, you have a choice of smart TV platforms: YouView, Freetime and Freeview Play. As well as providing standard TV channels (YouView and Freeview Play use Freeview HD, while Freetime uses Freesat HD) these smart TV platforms also connect to the internet to deliver a range of additional services.

YouView

YouView was the first smart TV platform to come to prominence. It offers a blend of free HD channels, which it receives over Freeview HD, and paid-for services from the internet. Its stand-out feature is its electronic programme guide (EPG), which integrates information about live and catch-up TV, so you can step back in time to watch programmes you missed using the main on-demand services, BBC iPlayer, ITV Player, All 4 and Demand 5. It's this seamless blending of live and on-demand TV that has really made the system a hit for us.

On top of that, companies are free to add their own choice of players, so

TV services compared

	Freeview	freesat	Freeview HD recorder	freesat +
Transmission	Terrestrial	Satellite	Terrestrial	Satellite
HD channels	0	0	12	11
Recording	✔	✘	✔	✔

What about streaming TV over the internet?

If you're sitting in front of your computer rather than your TV, you can watch most of the main terrestrial TV stations live using BBC iPlayer, ITV Player and All 4. Channel 5 doesn't let you stream live shows, but you can watch it and a host of others live at Filmon.com. To watch live TV legally through any of these services, you need a TV licence, which currently costs £145.50 a year.

If you only watch TV on demand or via catch-up services rather than live TV, you don't currently need a TV licence. This is likely to change in the future, particularly as the BBC will soon have to find the money to give free licences to anyone over 75. At the moment the government pays the BBC £608m a year to cover this, and the cost is likely to rise as the UK's population ages and the number of 75-year-olds increases. The changes will be phased in from 2018-2019, and the BBC will be looking to make back the money it loses. For a start, the licence fee will be linked to inflation, rising every year, but more extreme measures could also come in, and it's possible that viewers will need to pay to use iPlayer or, at the least, will need a TV licence to use it. We'll know more over the next couple of years.

YouView can also deliver Ultra HD 4K via the new BT box

⬆ The simplest YouView set-top boxes allow you to view programmes but not record

⬇ You don't need a TV licence to watch on-demand programmes on iPlayer, but that may change in the future

you can now use YouView to watch Netflix and Now TV or buy films from the Sky Store. This ability to add premium content to the free platform makes it the most versatile option.

To use YouView, you'll need a compatible set-top box. There are two ways to get one of these. If you buy one outright, you get all the basic services listed above. Alternatively, you can subscribe to a TV service with broadband from BT or TalkTalk. This will get you all of the above, and your YouView box will recognise the network it's connected to and give you additional content. This can be TV on-demand, such as catch-up TV and movies from BT, or internet channels that are added to the standard EPG. These behave like live TV channels, so you can record them as usual, but you receive them over the internet. Depending on the package you buy, the channels on offer can include Sky Sports and Sky Movies.

More recently, BT became the first UK TV service provider to offer an Ultra HD 4K channel for those with a fast enough broadband connection (you need a download speed of around

26Mbit/s) and one of the new Ultra HD YouView boxes.

To use the YouView service you need a set-top box and an aerial. It's available as a standard set-top box without a hard disk, such as the BT Mini YouView box (although you can still pause live TV), or as a PVR with dual Freeview HD tuners.

Freetime

Freetime is like Freesat's answer to YouView. It has all the common catch-up TV services, and you can use the EPG to find and view programmes you've missed. However, the platform doesn't support other on-demand players or premium services, such as Netflix or Now TV.

Freetime is built into some of Panasonic's TVs (and you can add a USB hard disk to record shows), but it's more commonly available through a set-top box. Standard Freetime boxes provide HD channels but won't let you record TV. Freetime with Freesat+ HD boxes include hard disks so you can also record programmes.

Freeview Play

Freeview Play is Freeview's equivalent of Freetime. In addition to the regular terrestrial channels, including HD versions, the service offers catch-up TV through BBC iPlayer, ITV Player, All 4 and Demand 5. As with the other services, you can use the EPG to find and view programmes you may have missed from the past seven days.

Freeview Play is a simple and consistent way to bring free TV and catch-up services to the masses. Crucially, TV manufacturers can use their own interfaces with Freeview Play (whereas YouView and Freetime require them to use the standard interface), and can add their own on-demand players as they see fit. For this reason, Freeview Play is likely to become the default base for a lot of TV's EPGs and a range of PVRs that

BT became the first UK TV service provider to offer an Ultra HD 4K channel, for those with fast enough broadband

catch-up services as part of its Freetime implementation.

A standalone Demand 5 app is available, however, so you can manually find content to watch. Freeview will be promoting its Freeview Play service over the festive period with lots of television adverts as it sets out to combat competition from YouView and Freesat. Netflix is also expected to
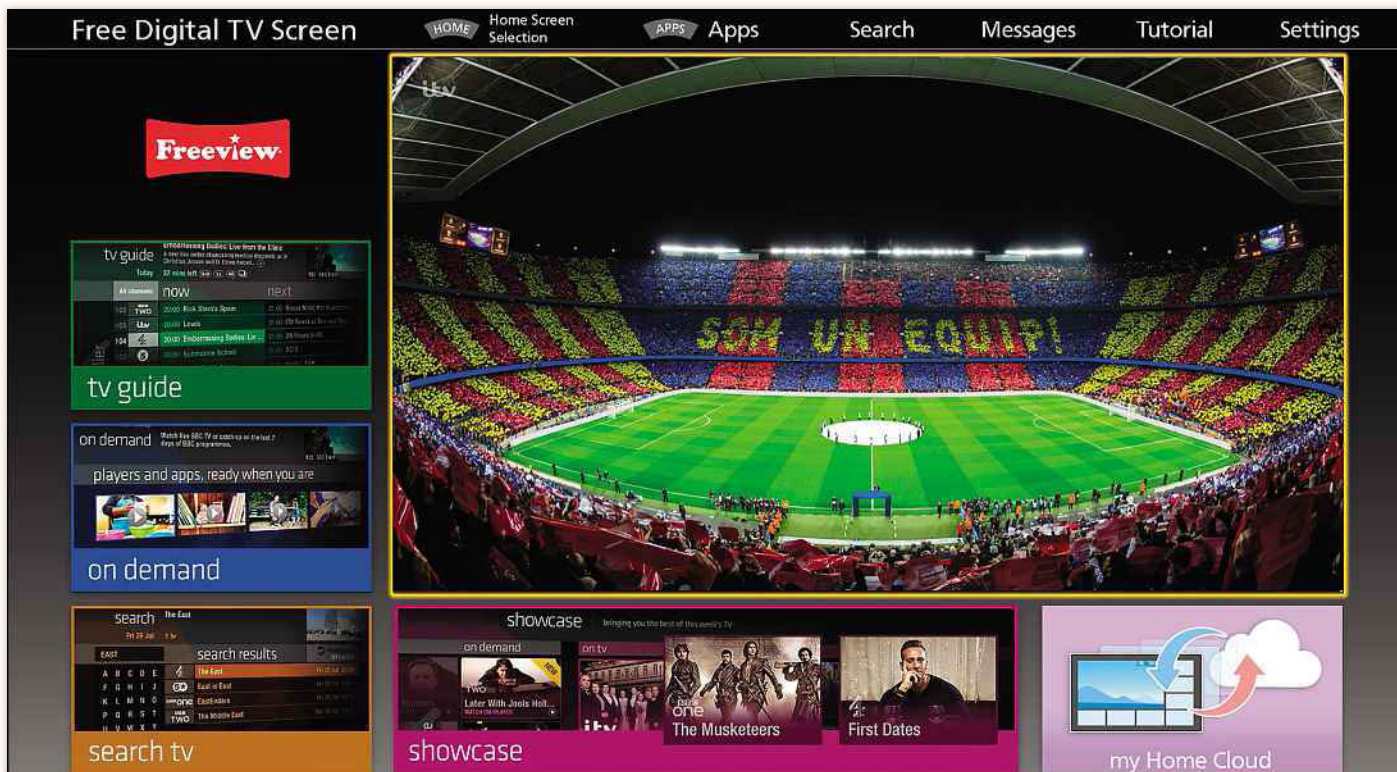
will be cheaper than their YouView equivalent. Note that most TVs with Freeview Play will also let you record if you plug in a USB hard disk.

Panasonic's Viera TVs are the first to come with Freeview Play built in, and set-top boxes from a range of companies are on their way. So far, Humax is the only company to release a Freeview Play-compatible set-top box – the FVP-4000T (see *Reviews*, page

50). This box costs £200, which is more than you'd pay for YouView, although a wider range of cheaper PVRs is expected to become available soon.

The one drawback with Freeview Play at the moment is that Demand 5 isn't available as part of the integrated catch-up TV feature, which means you can't navigate back a week through the EPG. This is a shame as Freesat provides the full complement of

come to Freeview Play-compatible devices in April 2016, which will help make Freeview Play devices an all-in-one entertainment solution.

Which one should I buy?

Three smart TV platforms may sound like too many, but the choice is really rather simple. If you have trouble receiving terrestrial TV because you live in an area with poor signal reception, go with Freetime. If you only care about catch-up TV, Freeview Play is the best option. If you want the most flexible platform with the option to pay for premium content, YouView is the best choice, particularly if you buy it as a package with your broadband from BT or TalkTalk. ▣

Smart TV

	youview	FreeviewPlay	free time
Transmission	Terrestrial	Terrestrial	Satellite
HD channels	12	12	11
Premium internet channels	Yes (via BT/TalkTalk)	No	No
Premium on-demand content	Yes (via BT/TalkTalk)	No	No
Recording	Yes (with PVRs)	Yes (with PVRs)	Yes (with PVRs)

"EVERYTHING THAT CAN BE INVENTED HAS BEEN INVENTED"

CHARLES H DUELL
(APOCRYPHAL)
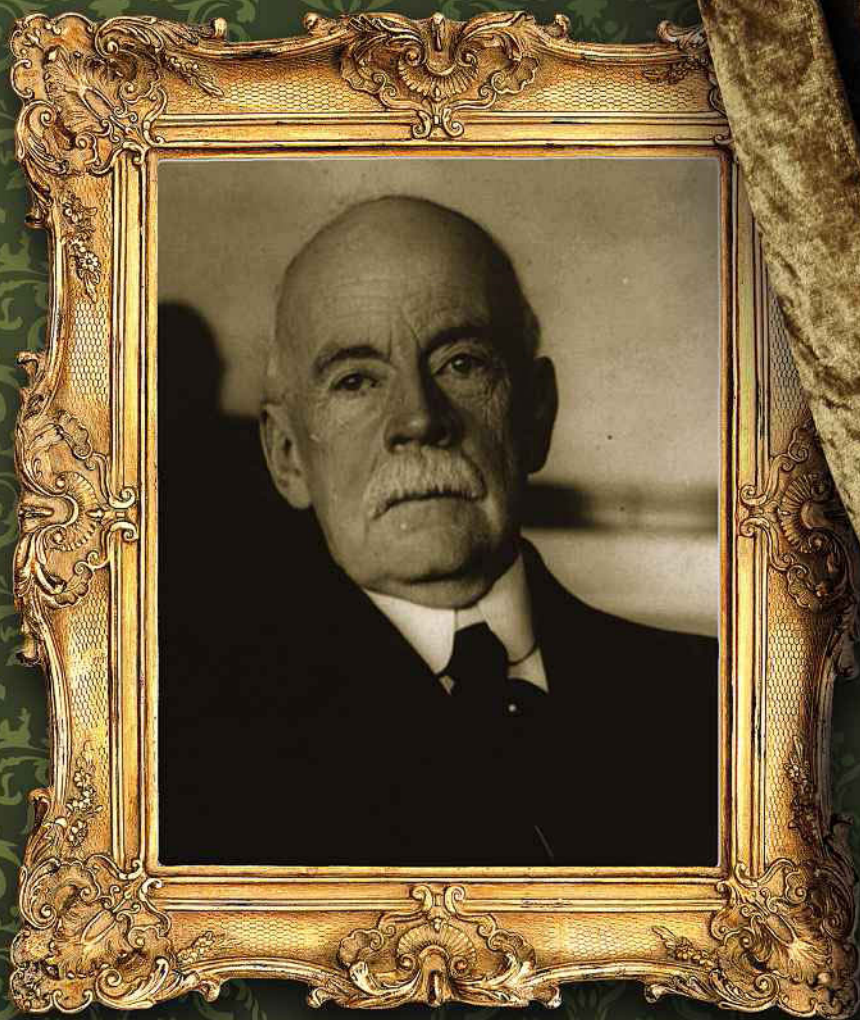
Think Instagram is a new phenomenon, or that drones only became a thing last year? Guess again, says Mel Croucher – the tech you love is much, much older than you realise

You can barely move for technological innovation these days, with every manufacturer keen to point out all the amazing features its new products have. Given this deluge of information, it's easy to be swallowed up by the hype and believe that we're living in a golden age of advancement. Do a little digging, however, and it soon becomes clear that many of the latest so-called innovations were really invented a long time ago. You may be surprised to know that everything from the digital watch to subscription TV was invented over 100 years ago, although it wasn't popularised until more recently.

Many of the things we take for granted today and perceive as new are actually rehashed ideas of old. The difference is that we now have the technology and infrastructure in place to make the most of some of these ideas and to produce products at a sufficiently low price.

Looking back at some of the biggest and 'newest' advancements, we set ourselves a challenge: could we prove that these products or services were really only invented within the last 100 years? Anything older than that deserves to fall into the category of 'the past' and shouldn't really count as a modern invention or innovation. This may sound a little far fetched, but we think you'll be surprised by how old some seemingly modern things are. To round things off, we've got a couple of quizzes to test your knowledge. So, without further ado, we step back into the past to see how it invented the future.

INSTAGRAM

The popular photo-sharing site was recently bought by Facebook for $1bn. It's packed with clever technology for editing and sharing photos and, you'd think, is the first app of its type. Sadly for Facebook, the truth is that the technology is a lot older.

First, you have to agree with the premise that Instagram's core function is to share images remotely. In which case, let us introduce Alexander Bain, the genius son of a poor Scottish crofter. He invented the electric clock and the telegraph in 1841, and two years later had designed a machine for transmitting documents, images and photos to be stored in a remote archive. In a word, Instagram! And if you want evidence, here's a photo of it in 1843 transmitting a portrait from the *New York Herald* to the *Chicago Times* a thousand miles away.

INVENTED

1841

ALEXANDER BAIN
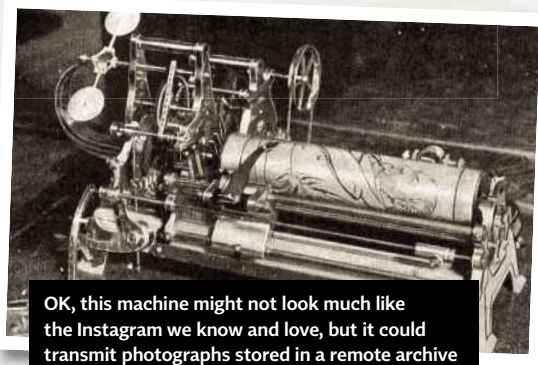
OK, this machine might not look much like the Instagram we know and love, but it could transmit photographs stored in a remote archive

Electric cars

First, let's look at the facts. Half a million electric cars were flogged around the world in 2015. Around 2,500 of these stealth vehicles are registered every month in the UK, and the market is growing by over 75% a year. The big breakthrough came six years ago when Mitsubishi launched the i-MiEV as the world's first mass-production electric car, drawing a hundred-mile range from a domestic wall socket. Surely, you're thinking, that makes it a modern invention, right?

Unfortunately not. The electric car was invented a long time ago. For your information, a fleet of electric taxi cabs, charmingly branded Electrobats, were scuttling around New York in 1912, and in fact electric road vehicles had been on the market since 1896. Before that, a nifty three-wheeler, complete with headlights and rechargeable batteries, had been frightening the horses since 1886, and an electric streetcar for paying passengers was running in Brighton three years earlier. A very smart electric car was also trundling about back in 1835, made by Dutch professors Stratingh and Becker. But the honours go to the Hungarian inventor Ányos Jedlik, who built the first electric motor and bunged it into a tiny electric car, which ran round in circles on his dining room table. That was during the festive season of 1828.

Eat your heart out Tesla: this electric car was trundling around in 1835

INVENTED

1828

ÁNYOS JEDLIK

Camera drones

Camera drones must surely have been invented in the past few years. Indeed, if you limit the definition to include only handheld, remote-controlled, self-propelled, smart, personal aerial devices that can be pre-programmed for height and direction, fly for miles, take pictures while up in the air, deliver a payload and then come back and land with pinpoint accuracy, you'd definitely say drones were a recent invention.

Well, you'd be wrong. Let us introduce Herr Julius Neubronner, the pharmacist who cracked it all back in 1907. He was using trained homing pigeons to deliver medicines to regular customers, but then he decided to make some half-decent money. He fitted his pigeons with aluminium breastplates and miniature cameras worked by time-delay switches, and sent them off on spy-in-the-sky missions. Then he developed and printed off a load of aerial images of cities and towns, which were snapped up by an intrigued public. During the First World War, Neubronner switched to battlefield reconnaissance and really cashed in. Half a century later the CIA trained its own spy pigeons and fitted them with battery-powered cameras but, surprise, surprise, the details of that are still classified.

You may, at this point, think we're cheating and that a pigeon doesn't count as a drone (and nor, for that matter, would a dolphin or any other creature). What you're after is a machine that's controlled by a battery-powered wireless remote control.

Well, why didn't you say so? You mean like the Tele Automaton demonstrated by Nikola Tesla at Madison Square Garden in 1898. His drone was aquatic with a dinky little metal antenna, and was operated by a battery-powered wireless remote control using Morse code for the speed and direction of the little beauty.

INVENTED
1907
JULIUS NEUBRONNER

It's only recently that we've worried about no-fly zones for drones, but we should have started planning back in 1907 when this pigeon-cam was invented

YESTERDAY'S QUIZ

As you'll see over the course of this feature, a lot of the technology we take for granted today was first introduced over 100 years ago. What we cover here is really just the start of it, so why not test your knowledge with our devious little quiz? If there's anything we haven't mentioned, send it in to letters@computershopper.co.uk.

All you have to do is select the correct answer as to who invented each of the following technical wonders and when they did it. Let's travel back in time and find out. Is it a, b, or c? Answers on page 123.

1 Which larger-than-life celebrity first specified a computer, complete with random access memory, read only memory, and with a built-in operating system, word processor and calculator?
a) Jonathan Swift describing The Students' Engine in *Gulliver's Travels*, written in 1726.
b) Charles Babbage's design for his Analytical Engine, specified in 1822.
c) The bearded wonder Alan Sugar, with his Amstrad PCW8256, selling for £399 in 1985.

2 What was the first modern programmable computer that actually worked, who built it, and when?
a) The Punch-Card Weaver, brought to life by French inventor Joseph Marie Jacquard in 1801.
b) The Z1 VersuchsModell, brought to life by German aircraft designer Konrad Zuse in August 1936.
c) Colossus, brought to life on 8th December 1943 by British engineer Tommy Flowers.

3 Who proposed the internet as a globally linked web for open-source data, text, graphics and broadcast content?
a) Belgian lawyer Paul Otlet, started in 1895, with 12 million files by 1910, and destroyed by the Nazis in 1940.
b) American inventor Vannevar Bush, for individuals to store, retrieve and share all the world's data via hypertext links, in his 1945 essay *As We May Think*.
c) Oxford professor and computer scientist Tim Berners-Lee in his proposal for a world wide web, dated March 1989.

MODERN HEADPHONES

It's hard to go anywhere now without seeing someone wearing a pair of Beats headphones, but while Dr Dre's latest "new generation" sets may seem brand new, the concept is actually a lot older. As it is, a near-identical design was marketed by Nathaniel Baldwin in 1910. Before then, music-lovers had to put up with the sort of contraptions used by telephone operators, radio hams and the military, but Baldwin designed his Superior Radio Head-Set model with popular music in mind, just like Dr Dre, but over a century before. All the familiar elements are right there in Baldwin's colourful cans, including adjustable sizing, a flexible headband, left and right speakers with independent pivots and the familiar jack plug. Unfortunately, he never patented the design, which is how good old John Koss was able to nick it in 1958, add a second core of wire and capture the stereo market at birth.

INVENTED

1910

NATHANIEL BALDWIN

Look familiar? These surprisingly modern-looking headphones were unleashed on the public back in 1910

The digital watch

Not quite as popular as they once were, the digital watch would seem to be a relic of the 1970s and 1980s. However, you have to step further back in time to find the origins of the product. In fact, the digital watch was invented well over a century ago.

The first digital pocket watch was produced by an Austrian engineer called Josef Pallweber, who came up with something he called a "jump-hour" mechanism in 1883. Instead of an old-fashioned dial, the jump-hour featured two windows that displayed the digits for hours and minutes as clear as day. After a couple of years, Pallweber's mechanism was on the market for the International Watch Company, but it was always more of a novelty than a money-spinner, and digitals fell out of favour until Pulsar brought out its LED version in 1973 – followed by Clive Sinclair's famous black watch two years later.

INVENTED

1883

JOSEF PALLWEBER

Digital schmigital – the first digital watch was out in 1883

4. Who first used the term 'bug' to describe a fault or glitch in a software or hardware process?
a) The inventor Thomas Edison in a snotty letter to a colleague in 1878.
b) The pinball wizard David Gottlieb in a 1931 advertising flyer.
c) Rear Admiral Grace M Hopper in her official logbook dated 9th September 1947.

5. Which smartypants first demonstrated television to the world?
a) Rignoux and Fournier in Paris, 25th August 1909.
b) Vladimir Zworykin in Saint Petersburg, 7th November 1911.
c) John Logie Baird at Selfridge's, 25th March 1925.

6. Who invented the flight simulator, complete with virtual motion and surround graphics?
a) Antoinette Gastambide at the French Army flying school in 1909. Early pupils included the first female fighter pilot and the King of Spain.
b) Edwin Link in 1927 using keyboards, switches and bellows nicked from a church organ.
c) Bruce Artwick in 1976, running on the Apple II computer, and available only by mail order.
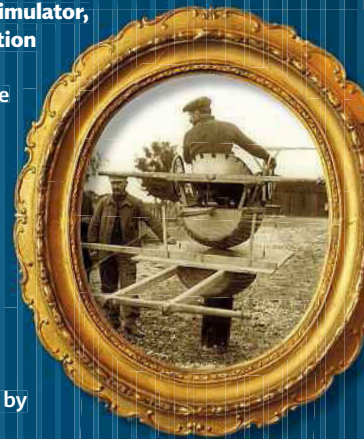
7. Who dreamed up the virtual reality headset?
a) Stanley G Weinbaum, as specified in his short story *Pygmalion's Spectacles*, dated 1935.
b) Ivan Southerland and Bob Sproull in 1968, although the headset was so heavy it had to be suspended from the ceiling.
c) Sega, with its 1991 VR Headset for the Mega Drive console.

8. Who sent the world's first text message?
a) Welsh-born professor of music David Edward Hughes in 1855, using a piano keyboard to type out the characters.
b) Friedhelm Hillebrand, a German post office engineer in 1985, who proposed the 160-character limit as long enough for any message.
c) Neil Papworth from Reading, who sent the SMS "Merry Christmas" using the Vodafone network on 3rd December 1992.

9. Who built the first programmable humanoid robot?
a) Anatolian inventor Al-Jazari in 1206. His mechanisms used replaceable cams to deliver instructions to robot musicians playing strings, woodwind and percussion.
b) Westinghouse Electric Corporation created Elektro in 1937, who could walk, talk, recognise colour and smoke weed.
c) Honda introduced Asimo on 21st October 2000, a fully functioning humanoid servant, playmate and guardian.

Answers: All the answers – a, b and c – are true, meaning that the correct answer to every question is a, the earliest date.

SUBSCRIPTION MOVIE CHANNELS

We admit that the first pay-per-view system was developed in 1951 by Zenith Phonevision. It used telephone lines to take orders and unscramble a television broadcast signal. While 1951 may be a little earlier than you thought for this type of service to make its appearance, it's not quite old enough. If you're not worried about the medium over which the television service is transmitted, though, you can go back to 14th April 1894 in New York City or, to be more precise, the corner of 27th Street and Broadway. That's where the Holland Brothers opened their Kinetoscope parlour with 10 machines, each showing a different movie. It cost five cents pay-per-view, so half a dollar for the entire bill. And yes, there were thrills galore, including dangerous sports and – how shall we phrase this politely? – specialist cock fighting.

Long before the likes of Sky, you could see pay-per-view movies with the Holland Brothers' Kinetoscope parlour

INVENTED
1894
HOLLAND BROTHERS

EMOJI

Emojis, emoticons, smileys, call them what you like, they're not something that only came into existence with smartphones and Facebook. They've been around for centuries and it's all thanks to Robert Herrick. Yes, he was indeed a poet, and everyone knows him for his line, "Gather ye rosebuds while ye may." When he was only a year old his dad topped himself by jumping out of a fourth-floor window, but this didn't seem to dampen his sense of humour. With the English Civil War raging round him, and in spite of being on the losing side against the Roundheads, he deliberately typeset the visual joke of a smiley in the second line of his poem *To Fortune*, right after the words "smiling yet". And here's a picture of the first edition to prove it. As for the date: 1648.

INVENTED

1648

ROBERT
HERRICK

To Fortune.

Tumble me down, and I will fit
Upon my ruines (fmiling yet :)

Far from being the parlance of the internet generation, emojis first appeared in 1648

MOBILE PHONES

Popular wisdom has it that AT&T launched its Mobile Telephone Service in 1949 and managed to sign up 5,000 customers, thereby inventing mobile phones. Unfortunately, that's wrong. Professor Albert Jahnke developed a wireless telephone in 1908. The hapless professor was arrested for fraud, but the charges were dropped as soon as the Oakland Transcontinental Aerial Telephone and Power Company signed up for the system. By 1918 mobile telephones were in regular use on German military trains.

INVENTED

1908

ALBERT
JAHNKE

All right, it's hardly an iPhone, but this mobile was available in 1908

SELFIE STICKS

Selfie sticks seem to have popped into existence very recently, helping the narcissistic put up more attractive photos of themselves on social media. But while the current craze has boosted their popularity, they were invented and used decades ago. We have a pair of selfies that should cause amusement. One snap (far right) is of Arnold and Helen Hogg from 1925, just after their wedding. It turns out that Arnold used to play piano to accompany silent movies, and came up with all sorts of gadgets, including his own selfie stick. But the device is so bleeding obvious that it goes all the way back to the earliest days of photography. Here's Robert Cornelius from Philadelphia (right), posing in 1839. He had to sit for over a minute to capture this selfie, triggered by a stick with a mirror on the end and a hook-lever to work the camera shutter.

INVENTED

1839

ROBERT
CORNELIUS

It's not just the young generation that's super annoying: our ancestors had selfie sticks back in 1839

FUTURE PREDICTED

Here's a brain-bending quiz based on the amazing technical prophesies of the English novelist and historian HG Wells, which he made in his novel *When The Sleeper Wakes*. It was first published in 1899, and set in London in the year 2100, and it described a future that most of us would instantly recognise. So, the question is, can you spot which ONE of the following 10 predictions did NOT feature in his book?

1 The automatic sliding door, which didn't appear in the real world until 1960. They're now an essential part of life, operating everything from shop front doors to lifts.

It's hard to imagine a world without this bit of kit: the automatic sliding door operator

2 The air conditioner, although when Wells wrote the book it was only three years before the real thing was invented by Willis Carrier in New York, and people in hot and humid countries rejoiced.

3 Atomic warfare, including mushroom clouds, deadly radiation fallout and the destruction of entire cities by a single "atomic bomb". The subject, obviously, came to prominence after Hiroshima and Nagasaki, fuelled by the cold war.

4 Wind farms, with precise details of their designs, scale and use, three decades before the wind turbine was invented and the first wind farms appeared. That in itself is surprising, as wind turbines are generally thought of as a fairly recent invention. By the 1930s, however, windmills were generating a lot of power for American farms, although a rural electrification project killed these off as a

national network provided more reliable power generation.

5 eBooks, for entertainment and reference, stored as software and displayed on handheld screens, more than a century before Sony released its first Reader. It's also a long time before *Star Trek* predicted a similar thing with its handheld PADD computers.

6 Computer-aided design, based on 3D scanners and robot fabrication of one-off and mass-produced designs, 58 years before Robert Heinlein nicked the idea for his sci-fi creation Drafting Dan. Now, it's hard to imagine a world without CAD, while 3D printing is starting to let us manufacturer products on demand.

7 Moving walkways, on a superhighway, citywide scale. The first commercial moving walkway was installed in Jersey City in 1954. Admittedly, this prediction assumed that we wouldn't walk anywhere and that moving walkways would be a great form of transport, but it's still a valid prediction.

8 Talk radio, for entertainment and news, but only a year before the Brazilian priest Father Roberto Landell de Moura transmitted the first human voice wirelessly, using an invention of his own making. De Moura was later denied requests by the Brazilian government to help develop

The atom bomb is an image of destruction from the 20th century, but did we know about its awesome power earlier?

Star Trek may have predicted the future, but did HG Wells get there first?

his invention and his future efforts weren't to have any impact on the world.

9 Cable networks, for data as well as utilities, linking everyone in a mega-city, and incidentally bringing that city to its knees when the network went down!

10 Intercontinental aircraft, including passenger planes, fighters, bombers and troop carriers, all four years before the first ever sustained, controlled, powered flight by the Wright Brothers (previous flights were largely uncontrolled or achieved in gliders).

(The correct answer as to which prediction did not appear in HG Wells' 1899 book is at the bottom of the page.)

We take flight for granted now, but back in 1899 anything more than a short glide would have been seen as hugely impressive

Answer: 5 Atomic warfare. Wells predicted the name "atomic bomb", its mechanism and its effects exactly, but not until he wrote *The World Set Free* in 1913, which was 32 years before Hiroshima. He made all the other predictions in his 1899 novel.

GREAT TECH FAILURES

For every product that really takes off, countless others are left by the wayside. We look back at innovations that, despite their promise, are more historical curiosity than disruptive gamechanger

Seeing a gap in the market and producing a product to fill it doesn't always lead to automatic success. While many technology products have failed in the past because they were simply bad ideas, history is also littered with launches that, on paper, should have worked. These are the products we're looking at here: they were designed to address a specific problem of the time but, for one reason or another, they didn't make the grade.

In some cases, the product was ahead of its time and the public would take a few years to catch up. Others missed the boat and addressed a problem that no longer existed. Some were just plain badly engineered, and then there are those that should have worked but didn't.

If there's one thing this teaches us it's that technology is hugely unpredictable. Join us as we take a look back at some of the great technology failures of our time.

Sinclair QL UNRELIABLE

? What should it have done?
Revolutionised the home computer market

! How would it have done that?
After the success of the ZX80, ZX81 and ZX Spectrum, Sinclair Research wanted to bring about the next big step in home computing and set to designing a machine that would outstrip the competition. The company was so sure of itself that it decided its next computer would be a Quantum Leap, the Sinclair QL, which launched in 1984.

The company's ambitions and ideas for improvement are hard to fault. For starters, the QL was powered by a Motorola 68008 processor. This chip had 32-bit data registers at a time when most home computers used 8-bit processors. Throw in 128KB of RAM and a retail price of £399, which wasn't much more than the price of the 8-bit BBC Micro Model B, and the QL looks, even now, as if it should have been a winner.

☹ What went wrong?
One of the biggest problems with the Sinclair QL was its brand new storage device, the Microdrive. This used a cartridge that housed a continuous loop of magnetic tape. It was designed to be cheaper than the competing floppy disk standards and faster than cassette, which most home computers still used. Nicknamed the stringy floppy, it had a capacity of 85KB – not much less than floppy disks of the time – and it was certainly very cheap. Unfortunately, it had two inadequacies. Microdrive media was slower than floppy disks, with access times of around 3.5s compared with milliseconds, and the tape stretched with use, making it unreliable. After poor sales, the product was suspended in 1985 and dropped entirely within two years. Amstrad went on to buy the company name and products in 1986. Amstrad-manufactured Spectrum models included the ZX Spectrum +2, which had a built-in cassette drive, and the ZX Spectrum +3 with a built-in 3in floppy disk drive.

Bubble memory NICHE

➡ Bubble memory failed to deliver on the promise it showed in the 1970s.

? What should it have done?
Given us universal storage that combines RAM and hard disks in one
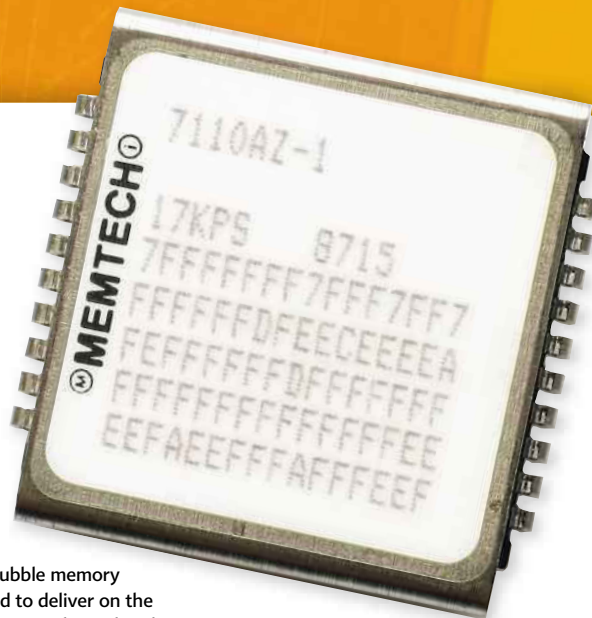
! How would it have done that?
One thing that's remained fairly constant in computers is that persistent mass storage, such as magnetic hard disks, has always been slower than volatile internal memory. In 1979, researchers believed they'd found the answer in the form of 'universal' bubble memory.

Also known as magnetic bubble memory, this new storage technology was designed to combine the strengths of hard disks (capacity and non-volatile storage) with those of RAM (high speeds) to create a single universal type of memory that could do everything.

The technology recorded data on the surface of a chip in the form of small magnetised areas, or bubbles. These could be manipulated by external magnetic fields to read or write data. A product was launched in 1979 in the form of Intel 7110 bubble memory. It had a capacity of 1Mbit (around 125KB) and could transfer data at a rate of 100Kbit/s. It cost $2,500.

In comparison, the state-of-the-art RAM of the time – the 4164 – had a capacity of 64Kbit and cost $100, so buying the 16 chips you'd need to match the 7110's capacity would cost $1,600. While the 4164 was slightly quicker than bubble memory, there wasn't much in it, and as this RAM was volatile it couldn't hold data once you'd powered your computer down. Seagate would launch the ST-506 hard disk in 1980, which gave you 5MB of storage for 'just' $1,500.

Having seen those comparisons, bubble memory might not seem such a good investment, but as the technology was brand new, it wasn't unreasonable to think that it would dramatically improve and costs would come down. Given the benefits of bubble memory, it really looked as if we'd found a single product that could do everything.

☹ What went wrong?
The main problem for bubble memory was that RAM and hard disk technology rapidly improved, with RAM getting much faster than bubble memory, while capacities increased and prices dropped. Hard disks didn't benefit from the same kind of speed boost, but their capacities increased dramatically and prices came down. Simply put, the benefit of combining a smaller amount of fast RAM with a large amount of slower storage outweighed any of the benefits of bubble memory.

Apart from niche applications, such as astronautics and military use, bubble memory failed to live up to its early promise. Now 40 years later, and despite several false starts, a single memory technology that can meet all our needs seems as distant now as it turned out to be in the 1970s.

Windows flops

You might be surprised to see the Windows operating system listed among some of the complete failures here, but not every version has enjoyed universal acclaim. Windows 8 and Windows Vista are widely acknowledged as failing where their predecessors succeeded. According to current usage statistics, less than 2% of PC users run Vista today, while its predecessor, Windows XP, accounts for between 4% and 16%, depending on who you believe. One of the main reasons given for its failure is its much increased memory requirement over XP. Bizarrely, although Windows 7 has the same requirements and was little more than a facelift, it still enjoys the support of most PC users today – more so, in fact, than Windows 8

and 10 combined, although Windows 10 looks set to be another success.

This isn't the first time a new version of Windows has failed to gain user support. The same thing happened with Windows 2.x, although in those early days it's easy to see why. After all, this was a new way of interacting with a computer, at least for PC users, and new ideas take a while to catch on. The same excuse can't be made for Windows Me, the Millennium Edition, which launched in 2000. Me should have been the first consumer version of Windows to be based on Windows NT technology, and if it had been, its fate might have been very different. Instead, it was the last in the line of Windows versions based on MS-DOS. Not only did it fail to

embrace the next generation of Windows, it didn't fully support DOS software either, so it fell between the two camps. Perhaps Me's lack of sales could be put down to the fact that it was only available for a year, but then successful products are rarely canned after so short a time. We'll give the last word to PC World, which in 2006 dubbed it the Mistake Edition and suggested, "This might be the worst version of Windows ever released, at least since the dark days of Windows 2.0 … users reported problems installing it, getting it to run, getting it to work with other hardware or software, and getting it to stop running."
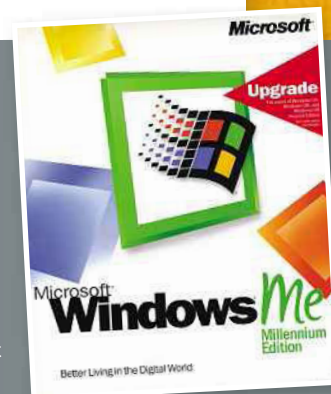
⬆ Windows Me was unreliable and based on old technology

Apple III   BROKEN

? What should it have done?
Changed the business computing world

! How would it have done that?
Although the first personal computers were snapped up by hobbyists, the rapidly maturing computer market soon attracted interest from business. In fact, something like 90% of Apple IIs were sold to businesses. To capitalise on this, the Apple III was designed to provide a powerful, scalable platform for businesses, leaving the Apple II for the home market.

☹ What went wrong?
Critics have pointed to a number of design flaws in the Apple III, but perhaps more telling was its appalling unreliability. You don't have to take our word for that, either. In a 1985 interview with *Byte* magazine, Apple co-founder Steve Wozniak admitted that "the Apple III shipped very late and had 100% hardware failures".

We take that to mean that every one that came off the production line

How to send mail at 670,000,000 mph.

⬅ The Apple III might be the first computer to work better after you'd dropped it

failed at some point. It's been reported that Apple service engineers, when speaking to customers who reported a fault, would advise them to lift the computer six inches and drop it on to the desk to reseat the chips in their sockets.

In the meantime the IBM PC came out and was a huge success, prompting software developers to write for that platform instead. The rest is history, with Apple taking a long time to bounce back from this failure.

Audio standards

The CD format was a huge success, but the discs were relatively large compared with casettes, and you couldn't record them as easily. As a result, Sony and Philips decided that there was a potential for a recordable digital format to replace the analogue cassette tape. Within just five years, not one but three such formats were launched – the MiniDisc (MD), the Digital Audio Tape (DAT) and the Digital Compact Cassette (DCC). No-one expected all three formats to succeed, but the reality was more brutal. Perhaps it was the lack of pre-recorded albums

⬇ The MiniDisk is just one of the digital audio formats that failed to win mass market support

or the public's reluctance to embrace another new format so soon after CD but none enjoyed mass-market success. The final blow was the emergence of MP3.

Nevertheless, the companies persevered. Recognising that the CD was rooted in 1970s technology and that higher-definition audio was now possible, attention turned to finding a higher-quality successor. Sony and Philips launched Super Audio CD (SACD), based on DVD technology, in 1999, followed by Panasonic's DVD-Audio the next year. Both offered some combination of higher-quality audio, multi-track surround sound and greater play time. Needless to say, both flopped.

A few years later, Blu-ray provided yet another opportunity to promote high-definition audio. The Blu-ray specification made provision for audio-only discs, and in 2013 a standard based on this format was launched. It's called High Fidelity Pure Audio (HFPA) and a handful of albums are available. Unless

we're very much mistaken, it's future is depressingly predictable.

Fortunately, downloads are here to save the day. High-quality digital files are becoming more popular, while the streaming service Tidal is looking to bring better-quality sound to the masses. Given the increase of internet speeds and the prevalence of streaming services, it seems reasonable to suggest that the quality of music (at least in technical terms – we can't vouch for the artistic merit) will improve over the coming years.

⬆ Three standards competed to be the successor to the analogue cassette tape, but all of them flopped
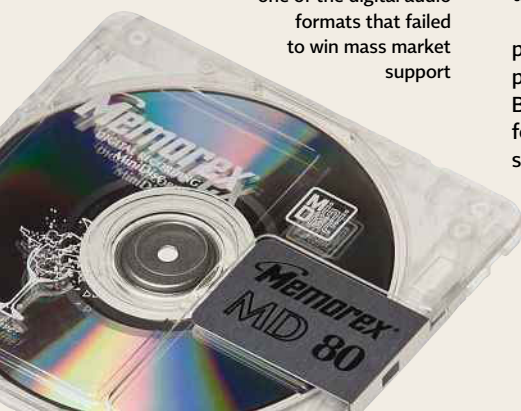
Integrated communications platforms

EXPENSIVE

❓ What should it have done?
Integrated all our methods of communication (email, voice and data) into one simple package

❗ How would it have done that?
Companies made several attempts to build an all-in-one device, starting in 1984, when British computer manufacturer ICL – better known for its multi-million-pound mainframes – brought out its One-per-Desk (OPD) personal computer for business users. The main difference between this and previous computers was that the OPD had a built-in telephone. This meant it could offer previously unheard of telephony features, including an address book, last number redial and automated call answering using speech synthesis. What's more, the OPD had a dial-up modem that allowed it to operate as a terminal for Viewdata – a standard that was similar in many respects to Ceefax, with its blocky graphics.

Perhaps a more famous attempt at an all-in-one communication device is Amstrad's e-m@iler, introduced in 2000. Like the OPD, it featured a screen and a telephone handset but now the aim was to provide an all-in-one device for those who didn't need or want a full-blown PC. In many ways it offered the same telephone facilities as the OPD, but it added email and Internet access. It also acted as a games console and allowed you to exchange text messages with mobile phones.

☹ What went wrong?
The OPD's downfall was as much a failure of marketing as anything else, but for whatever reason, the lure of a computer with a built-in telephone wasn't strong

➡ The Amstrad e-m@iler was a flop thanks to a mixture of poor value and terrible timing

enough for most people and the machine never took off. In the case of the e-m@iler, its main stumbling block – apart from its arguably questionable styling – was its cost. Perhaps the £80 purchase price wasn't a show-stopper in itself but the cost of using the device certainly was. The company adopted a pay-as-you-go model, which meant that every email and every megabyte of data was charged on top of the price of the phone call. By some estimates this added as much as £150 to an average user's quarterly phone bill.

In addition, the e-m@iler was launched at a time when mobile phones were growing in popularity and getting cheaper, so people didn't want or even need an expensive home phone. Meanwhile, low-cost computers and internet access were giving people all the data and email they could want. As a result, the e-m@iler is no longer with us, and it's the smartphone that has proved to be the real winner.

Google Glass ANTISOCIAL

? What should it have done?

Brought a new style of device to the masses and changed the way we use wearable technology

! How would it have done that?

Google Glass was something of a surprise when it was unleashed on the world. These specs with a heads-up display gave users a constant feed of information. Its possible applications were limitless, from providing map directions and email updates to giving health professionals access to patient records while leaving their hands free.

More importantly, while previous attempts at this kind of technology had resulted in heavy headsets, Google Glass was comparatively light.

☹ What went wrong?

Google Glass was launched to the public in May 2014 after a limited trial, with a consumer version due to follow, but just nine months later Google announced it was dropping the product. This was an unexpected development that surprised many third-party commentators. Writing about Glass on Google +, American technology evangelist and author Robert Scoble said, "This has changed my life. I will never live a day without it on." It seems the public had a different view, and showed a marked antipathy to wearing a pair of glasses with a tiny built-in screen.

Part of the issue is that Glass just isn't very comfortable, particularly if you're not used to wearing glasses. Indeed, people put up with the expense and hassle of contact lenses specifically to avoid having to wear glasses.

The public haven't endorsed Google's enthusiasm for wearable computing and communications

The technology is also a little off-putting: you just can't have a conversation with someone wearing a pair, as their eyes are always darting off to look at the screen. For people who want always-on information, smart watches are much neater and more discreet. Potential users were also worried about the privacy implications. If someone is going to take a photo or a video of you using a phone, it's pretty obvious, but Google Glass makes it far easier to record everything surreptitiously and upload it to a social network.

This doesn't spell the end of smart headsets, though. Many people are excited about Microsoft's HoloLens technology, for example, which overlays digital information on to the real world for a full augmented-reality experience. This technology can even be used in business, allowing people to work with 3D models projected directly into their line of sight. Perhaps in this case Microsoft will beat Google for innovation.

The x86 alternatives

For as long as most of us can remember, Windows-based desktop and laptops PCs have used either Intel x86 processors or chips based on the same architecture but produced by AMD. There was a time, though, when a whole range of alternatives promised to give x86 a run for its money, some of which would bring huge performance gains when used in the right situation.

When Windows NT launched in 1993 it supported Intel x86, DEC Alpha, and MIPS processors, and it was later ported to Itanium and PowerPC too. These alternative processor families were originally intended for high-performance workstations, servers and mini-computers, so with the economies of scale that would come with them entering the mainstream, their

continued support by Windows would have held the potential for affordable high-performance computing. History hasn't been kind to these upstarts, though, and in time they were all discontinued or repositioned, and all were dropped from Windows.

Today, Alpha is no more, having been discontinued shortly after DEC was acquired by Compaq, which itself was bought by HP. MIPS processors still exist, although you're more likely to find them in a Wi-Fi router than a PC. Itanium, first produced by HP but more recently developed jointly by HP and Intel, is still available although it doesn't have many friends. PowerPC had some considerable success in Apple computers before the company embraced Intel technology, and now
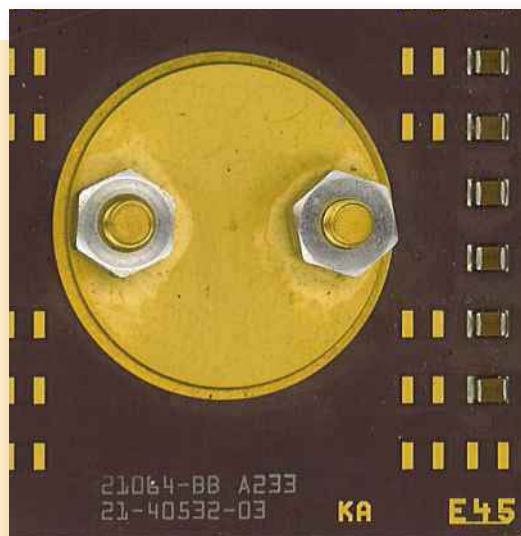
⬆ DEC's Alpha, despite being widely acclaimed, fared particularly poorly among x86's competitors

its close relative, the POWER architecture, is found in some of the world's fastest supercomputers. While it wouldn't be fair to describe all of them as failures, none lived up to the mass-market promise they showed in the late 1990s.

3D CLUNKY

The third dimension has had a chequered history, dating back over 160 years with little success

? What should it have done?
Replicated our binocular vision and brought depth to photos and films

! How would it have done that?
Photography first became a commercial success in 1839, and as early as 1851 a 3D photo of Queen Victoria was displayed at The Great Exhibition. 3D photography was quickly adopted among the upper classes and stereoscopes adorned many a Victorian drawing room, although it never really took off in the way regular photography did. More recently, the 1970s saw the introduction of the View-Master – a picture viewer that accepted discs of photos that produced 3D scenes when viewed through the binocular-style lenses. Although the View-Master was popular, 3D photography still didn't particularly catch on.

In the cinema, 3D films were shown as early as the 1950s, but they never unseated 2D cinema from its throne. It wasn't until 2009 and *Avatar* that 3D cinema appeared again in any meaningful way, and while there are a fair number of 3D releases today, it's fair to say that good old-fashioned 2D is still more popular.

TV has long dabbled with 3D images too. John Logie Baird demonstrated 3D TV in 1928, just three years after showing off his original set. Following that, the BBC first broadcast a 3D programme in 1982, while Sky had a dedicated 3D channel until recently. You certainly can't say 3D has failed through any lack of effort.

☹ What went wrong?
One of the biggest problems with 3D is that most forms require you either to look into a contraption, such as the View-Master, or to wear a pair of 3D glasses. In the BBC's 3D experiment in the 1980s, the 3D glasses had one red and one blue lens to separate the onscreen image into two (one for your left eye and one for your right), which created the illusion of depth but ruined the colours.

More recently, cinemas and 3D TVs have used passive 3D with polarised glasses. These are cheap and don't ruin colours, but they still add a layer of inconvenience to the simple process of watching TV, and people don't seem particularly interested any more. All 3D images suffer from the shortcoming that you can't choose what to focus on as you do with regular vision. For example, in real life you can focus on the window or the view outside. In a 3D film, the director has already made that choice for you, so the experience feels a little unnatural. This is also true of 2D photography and film, but there it feels more natural and draws attention to what the artist wants you to see.

The combination of inadequate technology and a general lack of interest has seen the latest wave of 3D fail. As a result, the BBC abandoned its 3D trial in 2013, while Sky closed its 3D channel in June 2015. There are still 3D Blu-rays on sale and many new TVs are 3D compatible, but it's rare for anyone to actually engage this mode.

So is that the end of 3D?
No. Depth is one of the great things about stereoscopic human vision, so the ability to recreate it is something people would want if done properly. One way is through VR headsets, which track motion and engulf you in a 3D world that you can look around. These could be brilliant for games. Another option is glasses-free 3D, which will make the experience less of a hassle provided it can be made to work properly. Then there are new techniques, such as holograms, which could provide real depth and a more natural way of looking at a 3D picture. We're not giving up on the technology yet, but beyond its niche uses 3D doesn't look likely to become the norm for a long time yet. ◾

⬇ Many modern TVs have a 3D mode, but viewers seem to have rejected it as a bit of a gimmick

View-Master 3D   3 REELS: 21 PICTURES
DUNGEONS & DRAGONS

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STEP 2 Search for *Computer Shopper* using the search icon in the top right of the screen

STEP 3 Click the 'Subscribe' button and pick your term

STEP 4 Enter your Google password to confirm

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Business Help

If you have database, office application or macro issues, **Kay Ewbank** can help. Send your problems to *businesshelp@computershopper.co.uk*

Finding duplicate values in Excel

Q Is there a way to compare two columns in Excel 2010 and see if they have any common values?

Shaun Brown

A Yes, there are several ways. If you're happy with seeing cells highlighted, you can use Excel's conditional highlighting. Select the columns containing the data, then on the Home tab, select Styles, Conditional Formatting. Choose Highlight Cell Rules, then choose Duplicate Values, which should highlight the values that are the same. The duplicates are shown in matching colours.

If you want to copy the duplicate cells to another column, the easiest way is to use a worksheet function. If the first set of data is in column D and the second set of data is in column E, you can see the values that occur in both columns by putting a formula in another column, such as F. In Cell F1, type =IF(ISERROR(MATCH(D1,$E$1:$E$20,0)),"",D1).

This assumes your data goes down to row 20; if you want to compare more rows, change $E$20. Copy the formula down column F as far as row 20, and you should see in column F any values from column D that are matched somewhere in column E.

The formula uses two functions: Match and IsError. Match provides a number giving the relative position of data in a range of cells. It has three arguments: the cell you're comparing, the range you're comparing to, and the match type. This can be 1, 0, or -1, and if you omit this parameter, Excel assumes you want to use 1. This looks for the largest value that is less than or equal to the lookup value, and the range you're comparing has to be in ascending order. Using 0 means Match finds the first value that's equal to the lookup value, and the range can be in any order. Using -1 tells Match to find the smallest value that is greater than or equal to the lookup value, with the range in descending order.

So if we use =MATCH(D1,$E$1:$E$20,0)', the formula returns the relative row number of the matching value, if there's a match. Otherwise, it would return #N/A. To get round this, we wrap the Match part in the If(IsError(part of the formula. This checks if Match has returned the #N/A error (or any other error). If it has, the If statement sets the result of the formula to the empty string (""). If a number is returned, a match has been found, so the If result is set to the value being compared, which is in the current row of column D.
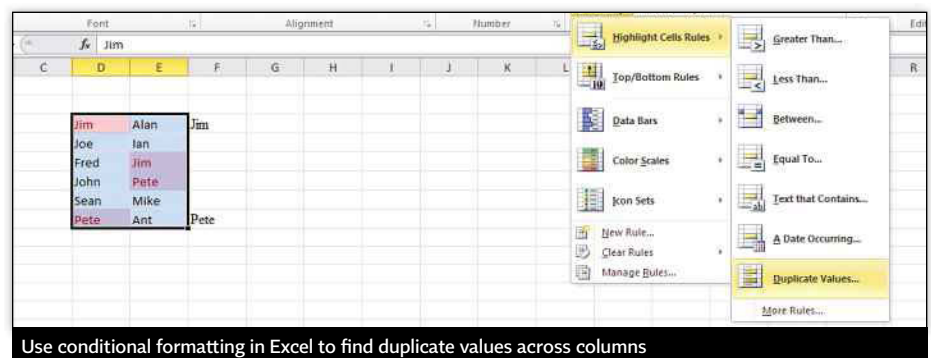
Use conditional formatting in Excel to find duplicate values across columns

Including images in Word mailmerge

Q I'm creating a set of mailmerge letters using Word 2010, and I want to include some images. When I've tried doing this, I get an error message telling me the linked image can't be displayed. The message says the file may have been moved, renamed or deleted, but they're where they are supposed to be. Ideally I'd like to be able to send specific images to specific people, but if that's not possible, I'll settle for just being able to include a linked image.

Richard Romney

Use an IncludePicture field in Word to insert images into a mailmerge document

A It's trickier than it ought to be to insert variable images in Word mailmerges, to the extent that I usually avoid it. If you use an IncludePicture field, the pictures won't appear until you've refreshed the fields in the output document after you've carried out the merge, and the images remain embedded in the original file, so you have to be careful if you want to re-use the document or send it to someone else to do the merge.

To overcome these problems, you'll need to use quite a complex formula. If you're printing the document rather than emailing it, and you're happy to have the image linked to its original location, you can use a field construction: '{ INCLUDEPICTURE { IF TRUE "{ MERGEFIELD <<ImageFilename>> }" } \d }'.

The curly brackets are field delimiters, and you insert them by pressing Ctrl-F9 for each pair. This is one reason why this process is so complicated, so be careful. The \d part at the end of the statement stops the graphic being stored as part of the document. This keeps the file smaller, but if you want to email the documents, you need to remove the \d. The <<ImageFilename>> refers to the field in the mailmerge data file, which should contain the full filename and path to point to the image, with the separators between the folder names doubled up. So if your images are stored in your My Pictures folder, the ImageFileName field would contain something like C:\\Users\\Kay\\My Pictures\\brash.jpg.

Counting number of entries in Access

Q How can I show the number of times a value appears in a table in my Access 2007 database? I want to find a list of all the teams we've played in our sports league, alongside the number of times we've played them. I'd like to produce a list like this:

|	
Next Town Utd	4
Rival Wanderers	3
Smalltown FC	2

And so on.

James McKenzie

A You need to use a combination of the Count() function and the Group By clause. It's easiest to give you the query in the SQL format. If your table is called Opposition, and the team name is TeamName, you can see the list using:

    Select TeamName, Count(*)

From Opposition
Group By TeamName

The Group By clause is what makes this query work. Group By tells SQL to produce a summary in which records with identical values in the specified field are shown combined in a single row. If you then use one of the SQL aggregate functions such as Sum or Count in the Select statement, you also get a summary value corresponding to the function.

You can enter the SQL directly into Access by choosing SQL view from the Query View options. If you're more comfortable using the query grid, what you need to do is to add the Totals row to the query view, and choose the Group By option on the TeamName field. You then need to add a calculated field of Expr1: Count("*") and set its Total row to be Expression.

Use Group By and Count(*) to view counts of records in Access
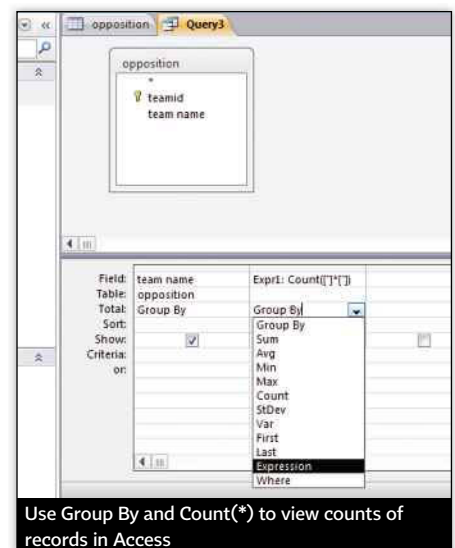
How do I make Outlook speak to me?

Q Is there a way to make Outlook speak the details of reminders for appointments when the reminder is triggered? One of my colleagues has this enabled on his Mac, but I'd like to stay with Windows if possible. I'm using Outlook 2010.

Ken Fraser

A This is an intriguing question. Office 2010 onwards has a Text to Speech facility, so the first thing to do is to make sure that's working on your system. You can make Text to Speech available in Outlook by adding the command to the Quick Launch bar. With Outlook open, look at the top of the Outlook Ribbon for the Quick Launch bar.

This is the small toolbar next to the Outlook icon at the top left of the window. Click the button at the very right of this toolbar, the one that has a line above a downward facing triangle. In the list that appears, click on More Commands. You'll see a dialog box showing the available commands in the left-hand pane, with any commands already on the Quick Launch toolbar in the right hand pane. You need to change the option from Popular Commands to All Commands, then select Speak from the list of commands. Click on Add to add it to the Quick Launch Toolbar. You can use it to hear single words or blocks of text by highlighting the text you want to hear, and then clicking the Speak command.

We have to say that on our test machine, the speech came out rather gabbled. You can slow it down in the Control Panel (and can apparently choose alternative voices, though on our machine only one was available). Open the Control Panel, and choose Ease of Access. Click Speech Recognition, then click Text to Speech in the left-hand panel. You'll see there's an option for voice speed; if you find the speech is too fast, set this to a slower speed – you can test the way it will sound by clicking Preview Voice.

Once you've got the speech working at a reasonable speed, the next step is to make the option available in a macro that runs when a reminder is triggered for an appointment so you get the audible alert you want. In the Developer tab of Microsoft Outlook, add a reference to the Microsoft Speech Object Library to the references listed in the Tools, References list. Then enter the macro below:
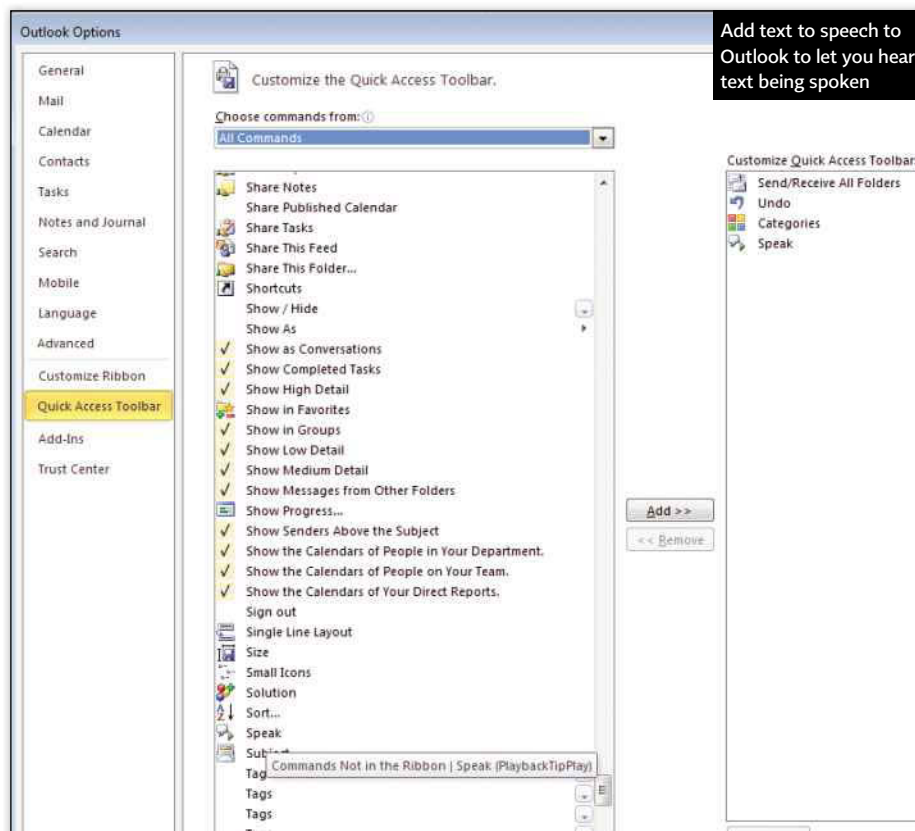
```
Private Sub Application_Reminder(ByVal
  Item As Object)
Dim oVoice As SpVoice   ' Voice Object
If Item.MessageClass <> "IPM.
  Appointment" Then
  Exit Sub
End If
Set oVoice = New SpVoice
oVoice.Speak Item.Subject
oVoice.Speak "Starts at "
oVoice.Speak Format(Item.Start,
  "hh:mm")
End Sub
```

You can combine the elements being spoken to get a more even rendition by using:

```
oVoice.Speak Item.Subject & "Starts at
  " & Format(Item.Start, "hh:mm")
```


Add text to speech to Outlook to let you hear text being spoken

137

Helpfile

Whatever your general PC, hardware and software woes, **Simon Handby** is here to help. Send your problems to *help@computershopper.co.uk*
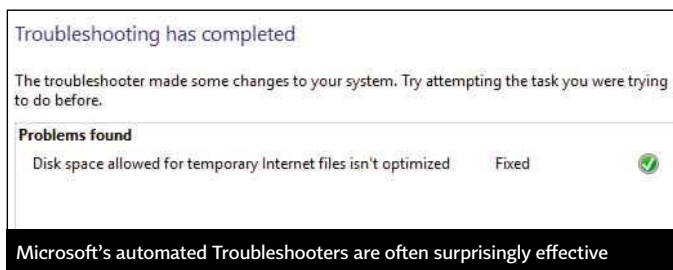
Broken downloads in Internet Explorer

Q I recently tried to download Skype to my two-year-old Lenovo laptop running Windows 7, but it managed a partial download then stopped. I tried downloading other programs, with the same result. I searched through Internet Explorer's settings, and eventually found that the size of the temporary internet files folder was set to 0MB. If I tried to increase the size, I got the message "Please select a value between 8 and 8 for how much disk space Temporary Internet Files may use."

Since none of my anti-virus and malware software identified a problem, I reset IE's settings in the hope that this would fix it, but it hasn't. I would appreciate any advice you could give me.

Eric Atkinson, atkineric@btinternet.com

Troubleshooting has completed

The troubleshooter made some changes to your system. Try attempting the task you were trying to do before.

Problems found

Disk space allowed for temporary Internet files isn't optimized   Fixed   ✅

Microsoft's automated Troubleshooters are often surprisingly effective

A There are a few things you can try. Click the Start button, type 'regedit' (without quotes) and run regedit.exe, providing permission if needed. In the left pane, expand HKey_Curent_User, then navigate to Software\Microsoft\Windows\CurrentVersion\InternetSettings\5.0\Cache. Expand the Cache key, right-click the Extensible Cache key within it and delete it. Close the Registry Editor.

Now open Internet Explorer, select Internet Options from the Tools menu, click the Settings button under Browsing history on the General tab and set 'Disk space to use' to a suitable number – the default is 250MB. Click OK and retry your download. If it still doesn't work, repeat the steps above but only navigate as far as the 5.0 key in the Registry Editor, then delete the Cache and LowCache keys within it and reboot.

If that fails, run the Internet Explorer Performance troubleshooter. Find this by opening the Start menu, searching for 'troubleshoot' and running Troubleshooting. Agree to the message asking if you want the most up-to-date content, then click View all in the left-hand pane.

If your download still doesn't work, try using another browser such as Firefox or Chrome or, if all else fails, create a new Windows user. To do this, search for 'user' in the Start menu and select User Accounts, click Manage another account then click Create a new account and follow through the process. You'll need to move your existing files manually from your Desktop, Documents, Music and Video folders in C:\Users\Old_user_name to C:\Users\New_user_name.

Recursive application data folder

Q For some time I've found that my Application Data folder keeps replicating itself as a subfolder within itself – for example: C:\Users\Tonys_Phenom\AppData\Local\Application Data\Application Data\Application Data\Application Data\Application Data\ … Microsoft Games\Chess Titans. I've read that it's because I changed the permissions on one of Windows' so-called junction points – in effect, a link to a folder – rather than the folder itself. How can I fix this issue?

I've also bought a new SSD for the PC, and I want to migrate my existing installation to it. Is it possible to restore to the new drive from a backup, or should I reinstall my system from scratch?
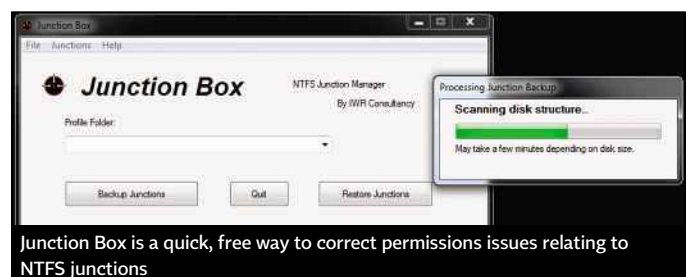
Finally, I'd like to try Windows 10 but I'm reluctant because I've read that my Windows 7 licence will be unusable once I've upgraded. I'm concerned that I won't be able to reinstall Windows 7 at a future date and that at some point it will cease to be supported. Is this true?

Tony Settle, tony.settle@gmail.com

A The recursive path problem is indeed down to permissions. A free fix is available in the form of Junction Box, which you can download from *sourceforge.net/projects/junctionbox*. Extract the contents of the Zip file to a new folder and run JunctionBox.exe. Click the Backup Junctions button to back up your current junctions to JunctionBackup.ntj. With that done, select Tonys_Phenom from the Profile Folder and click Restore Junctions, then select DefaultJunctions.ntj as the source. That should fix the problem.

You don't say which backup software you have or whether your new SSD came with a cloning tool. For example, Crucial ships some SSDs with Acronis True Image HD, which is ideal for cloning an installation to a new disk. To use it, both SSDs must be installed in the PC at the same time. If you can't clone the disk, restoring from a full backup should work, but depending on the software you're using it can be tricky.

The answer to your final question is that if you have a boxed copy of Windows 7, you will be able to reinstall it in the future. However, if you previously upgraded an installation of this licence to Windows 10, you'll have to stop using that installation or buy a new licence. As we understand it, if you have an OEM version of Windows 7, you won't be able to revert to it or reinstall it after the one-month rollback period has expired. Microsoft will eventually stop providing Extended support for Windows 7, but not until 14 January 2020.

Junction Box   NTFS Junction Manager   By IWR Consultancy

Profile Folder

Processing Junction Backup

Scanning disk structure…

May take a few minutes depending on disk size.

Backup Junctions   Quit   Restore Junctions

Junction Box is a quick, free way to correct permissions issues relating to NTFS junctions

I've been blacklisted!

Q I'm using Steganos Online Shield, which is designed to protect my laptop from hackers by changing its IP address to one that Steganos controls. It seems someone using that IP address did something to get blacklisted, but it wasn't me. Is there a way around this other than rebooting and obtaining a different IP that, hopefully, works?
Steve Stacher

A The short answer is that you can't do much but restart, log back in and hope that fixes the problem. It's not uncommon when using a VPN service such as Online Shield to find either that certain content providers have identified and blocked the public IP addresses that the service uses as its exit points, or that one or more of the addresses is blocked due to abuse. In either case, the issue might recur until Steganos either uses a different IP range or has any blacklisting removed. If your problem persists it's worth reporting it to support@steganos.com.

VPN services can add safety or dodge content restrictions, but they have drawbacks
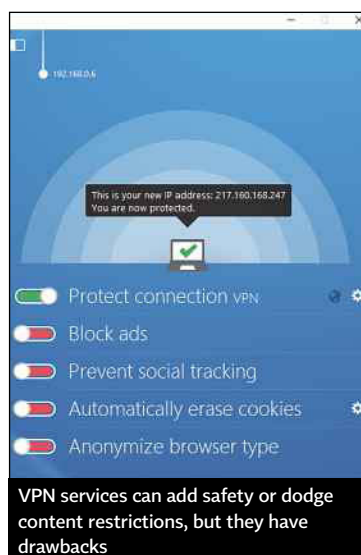
Which printer should I buy?

Q My son has requested a printer for Christmas. He needs one that can make photocopies, supports Wi-Fi and will work both with his Windows 7 PC and his iPad and iPhone. It doesn't need to be especially fast or to print particularly exquisite photos, and he'll probably need to print only a few A4 pages a week. I wonder if you could suggest something suitable?
Keith Jones, senoj07-disp@yahoo.co.uk

A If your budget stretches to around £70 we'd recommend Canon's Pixma MG6650, which is a very good mainstream multifunction peripheral (MFP). Its chief weaknesses are that it doesn't have an automatic document feeder (ADF) for multi-page scans, and there's no fax modem, but your son probably doesn't need either. For about £50 you could get the Canon Pixma MX495, which has both a fax modem and an ADF but is more basic than the MG6650 in other ways: it's slower, with slightly inferior print quality and doesn't offer automatic duplex (double-sided) printing.

The installer for either device will walk you through the process of connecting the printer to your wireless network, and once connected your son should be able to print from any iOS device that's on the same network. What's more, he can install the Canon PRINT Inkjet/SELPHY app from the App Store, which will add more print options and enable scanning to the iOS device.

My screen won't turn off

Q I recently upgraded from Windows 7 to 10. Everything went well, but a minor problem has got me stumped: my display no longer powers down when the PC is left idle. I've checked the power and sleep settings both in Control Panel and the new Settings app. Both agree that the screen should shut down after 15 minutes, but nothing happens. I've tried updating the screen and graphics card drivers with no luck. Any suggestions?
Michael Soper

➔ If your screen won't switch off, try unplugging games controllers and touchscreens
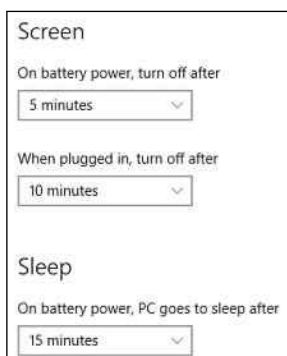
A We're not sure yet if it's deliberate, but Windows 10 stops the screen powering down when certain USB devices are connected. Games controllers are the most common culprits, but other interface devices such as touchscreens can also cause this problem. Unplug any USB input interface other than your mouse and keyboard and see if the screen sleeps. Given the number of complaints over this, we suspect that a future update will change the behaviour, so try re-connecting the offending device after each cumulative update – usually installed around the second Wednesday of the month in the UK.

I don't want Windows 10

Q I have a 10-year-old laptop whose hardware I upgrade more for hobby than practical purposes. Surprisingly, it accepted a clean installation of Windows 8 Pro and subsequent upgrade to Windows 8.1 with little fuss, except that the wireless card stopped working. I didn't reserve a Windows 10 upgrade on this PC, but one day Microsoft announced that it was suitable for the upgrade and that I merely had to accept a Windows update to start the process.

The results were disastrous. The laptop ground to a halt. The wireless card worked but the sound card disappeared. The version of Windows 10 I received lacked Bitlocker, even though I had it in Windows 8 Pro.

You'd be right to ask what I expected from a 10-year-old laptop, but while I don't resent the weekend I spent restoring Windows 8.1, I'm concerned at having a major upgrade forced on me. A search reveals a number of Heath-Robinsonesque solutions for refusing the update, but I'm concerned by the implications of editing the Registry or refusing recommended updates. How can I avoid the Windows 10 download?
David Whyte, davidwhyteccltd@gmail.com

A As you say, there are many ways to stop the forced upgrade, at least one of which involves editing the Registry. That's usually something we're happy to recommend, but in this case somebody has developed an applet specifically to take control of Windows' upgrade behaviour.

Visit *www.ultimateoutsider.com/downloads*, download GWX Control Panel and run the program (no installation is necessary). Use the buttons to disable the various Windows 10 upgrade features: the key one is 'Are Windows Update OS upgrades enabled?', which you should set to No. After a reboot, the PC shouldn't be forcibly updated.

Note that future Windows Updates may introduce new settings or revert those that the GWX Control Panel controls. It may be an idea to run the program after your laptop has installed Microsoft's monthly patches (usually the second Wednesday of the month in the UK) and to check periodically for an updated version of the GWX Control Panel. **CS**

Microsoft wants us all to upgrade to Windows 10. GWX Control Panel lets you opt out

Working with 4K video

We're told that 4K is the future of TV, but what does that mean for your own video productions? **Ben Pitt** examines if, when and how to upgrade

THE CONSUMER ELECTRONICS industry is always looking for a new technology to push, and the current focus is 4K. With four times as many pixels as 1080p HD, it looks good on paper. Here at *Shopper* we've been seriously impressed by the quality of 4K projectors and TVs. Whether that converts into demand remains to be seen. We all know what happened when TV manufacturers tried to convince us to upgrade to 3D a few years ago.

Most people will wait until the technology matures, the prices come down and more 4K content is available, but media creators have different priorities. The issue of whether 4K becomes commonplace is certainly relevant, but it's not the only factor. Media creators may need to be more pre-emptive.

When issues of format adoption come up, I'm always reminded of the children's TV series *Camberwick Green*, which was made for the BBC in 1966 and shot in colour, even though BBC1 didn't start broadcasting in colour until 1969. This forward-thinking approach meant the programme was ready and waiting when the schedulers were looking for colour programmes to broadcast. Ultimately, it lead to many more reruns of *Camberwick Green* than might have happened if it had been shot in black and white.

Consumers are generally happy with 1080p HD, and the cost and complexity of shooting in 4K might not hold much appeal. However, looking back through my old productions, the ones shot at standard definition look fuzzy by today's standards. It's certainly conceivable that in five years, 1080p will look blocky once we've all become accustomed to 4K.

⬆ BlackMagic's 4K cameras are priced within the range of amateur enthusiasts

standard will be, but in the fast-paced world of internet streaming, video standards aren't as easy to pin down as they once were.

Optical media is showing the clearest signs of what's to come, with all the big electronics companies signing up to an Ultra HD Blu-ray specification. This defines 4K as being 3,840x2,160 pixels at frame rates of up to 60fps, and is more often called Ultra HD or UHD. The Ultra HD Blu-ray specification also supports 10-bit colour (commonly known as HDR) to deliver a greater range of bright and dark compared with conventional 8-bit colour. It also offers a wider colour gamut than current formats allow, known as Rec.2020.

Most 4K TVs we've reviewed at *Shopper* use the same 3,840x2,160-pixel resolution. We're also just starting to see TVs that support HDR, such as the Samsung JS9000, but they aren't on sale yet. There are various

has a wider aspect ratio than UHD and is generally associated with cinema. I haven't seen many digital cameras that support it, but the Panasonic GH4 and Samsung NX1 are two exceptions. Unless you have ambitions for a theatrical cinema release of your productions, we don't think it's a must-have feature.

CHOOSING A CAMERA

The number of 4K-capable cameras is growing fast. Of those we've reviewed in *Shopper*, all can record at 3,840x2,160, usually at a choice of 24, 25 or 30fps. Panasonic has been particularly enthusiastic in embracing 4K, adding it to its flagship GH4 compact system camera (CSC) and also the GX8, G7, FZ1000, FZ330 and LX100 cameras, the X1000E, WX970 and VX870 camcorders and the HX-A500E action-cam. The G7 costs around £540 (or £440 with a £100 cashback offer, valid until 12th January 2016), putting 4K video production within the reach of the amateur.

Sony isn't far behind with its 4K cameras, which include the a7R II and a7S II full-frame CSCs, RX10 II and RX100 IV fixed-lens cameras, AX100, AX33 and AX1 camcorders and X1000V action cam. Sony is also a leading manufacturer of professional 4K video cameras. Prices start at £4,150 for the PXW-FS5 camcorder, which uses the same E-Mount lenses as its CSCs.

Samsung has made inroads, too, with the NX1 and NX500. However, as we go to press there is mounting speculation that Samsung has halted development of the NX1, and the future looks uncertain for the NX system. We're also put off by Samsung's decision to capture in HEVC format, which isn't widely supported by video-editing software.

GoPro has included 4K capture on its Hero Black Edition cameras since the Hero 3,

Most people will wait until 4K technology matures and the prices fall, but media creators have different priorities

The turning point in my own archive is a pop promo video I shot in 2006 using a Sony FX1 camera. This camera recorded to MiniDV tape in the now-obsolete HDV format, with a 1,440x1,080-pixel resolution. By the time I'd finished applying effects, cropping the picture and deinterlacing, the resulting video couldn't really be described as high-definition, but it allowed me to export at standard definition (720x576) and produce a sharp picture beyond anything a standard definition MiniDV camera could have produced.

In order to prepare for a new broadcast standard it's helpful to know what that

implementations of the HDR concept, such as Dolby Vision and Philips HDR. It remains to be seen whether they'll work with each other, or whether one version will come to dominate.

Netflix and YouTube's 4K streaming is at UHD resolution too, although as with any streaming service, new formats can come and go at a startling pace. If and when HDR and Rec.2020 gain widespread support among content creators and display devices, it won't take much for streaming media services to add support if they feel the urge.

Another common 4K resolution is 4,096x2,160, also known as Cinema 4K. This

although only the 3+ and 4 support frame rates up to 30fps. The Nikon 1 J5 records 4K video, too, but only at 15fps, which is too low for serious use. Canon's 4K range is limited to professional models costing over £5,000 – the EOS 1D C, XC10, EOS C300 Mk II and C500.

Even if 4K cameras are available at consumer-level prices, kitting yourself out for HDR and Rec.2020 isn't easy on a limited budget. All the cameras I've reviewed record video colour at eight bits per colour channel (24-bit for the three channels in RGB colour). Camera sensors typically measure colour at 12 or 14 bits per channel, but conversion to 8-bit colour is just one of many techniques used to get the data rate down to manageable levels.

There are exceptions, though. The BlackMagic Ursa Mini 4K (opposite) records video in 12-bit Raw format to CFast disks (the latest version of CompactFlash). Starting at £2,025 for one with a Canon EF lens mount, it's within reach of amateur enthusiasts.

These Raw files are enormous, weighing in at 2.1Gbit/s at the highest quality setting. However, the camera can also save in a compressed Raw format at 1Gbit/s, plus various Apple ProRes formats in 10-bit colour, with bit rates ranging from 880Mbit/s to 180Mbit/s for 4K capture. We haven't had a chance to try BlackMagic's cameras but we've seen lots of positive reports about the sharp details and wide dynamic range of their footage, and these are backed up by 4K

sample footage available on YouTube. They seem to be a good option for videographers working within tight budgets who want to pave the way for HDR and Rec.2020.

A lot can be done with 8-bit codecs, too. An increasing number of camera makers, including Sony, Panasonic and GoPro, include flat picture profiles for their video capture modes. These produce rather dreary colours but they're designed to capture unprocessed colours from the sensor. The result is greater detail in the darkest and brightest areas of the frame compared with video captured using picture profiles that are designed to look great. Flat profiles are designed on the basis that the footage will be colour corrected – or graded, as it's commonly known – so they give the editor more colour information to work with. In this scenario, the argument is that you could work towards a 10-bit finished production from 8-bit footage. We'll have to wait to see how the standards and editing software develop, though.

OVER-SAMPLING FOR 1080P
Even if you only ever plan to export at 1080p resolution, there's a strong argument for shooting at 4K. A 1080p frame has just over two million pixels but there are various reasons why these pixels aren't as sharply detailed as they could be.

Digital images require anti-alias (AA) filtering to avoid a blocky appearance to pixels

and moiré interference across repeating patterns. Most camera sensors have a hardware AA filter built in, but depending on how the full-resolution sensor read-out is converted into a 1080p frame, this filter might not be particularly effective for video. Some video modes exhibit aliasing artefacts as a result, while others blur details slightly to avoid artefacts. The best cameras for video – notably Panasonic's Lumix G cameras and certain Sony models that shoot in XAVC S format – use high-quality resizing and anti-aliasing to create 1080p frames, but in our experience you can always get a sharper 1080p picture by starting with 4K footage.

That's probably because, no matter how good the raw 1080p picture is, the camera has to compress it before it can save it to the memory card. AVC compression records colour information at a lower resolution than brightness information, and then applies lossy data compression to discard image information that hopefully won't be missed. However, applying heavy colour correction can make these compression artefacts more noticeable. Shooting at 4K and resizing to 1080p means there are four recorded pixels for every pixel in the finished production, so compression artefacts and other errors in the recorded footage are much less visible.

Certain other video effects can benefit enormously from 4K footage. Chroma keying – also known as the greenscreen effect –

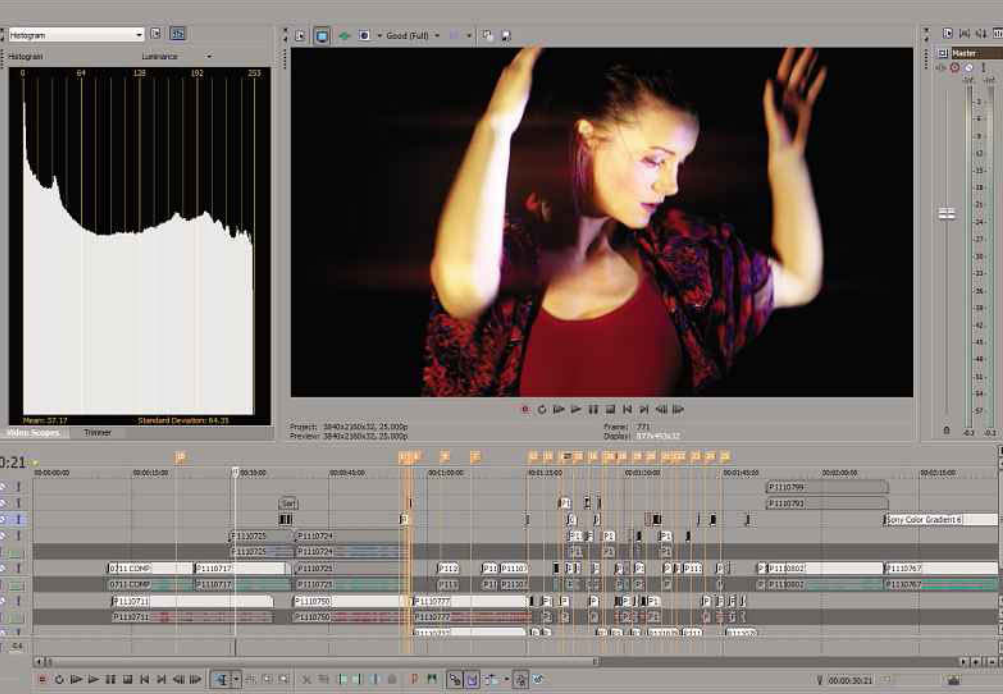## Extreme close-up: the benefit of over-sampling

UHD	1080p	UHD downsized to 1080p

These are crops from the Panasonic GH4's video output. There's lots of extra detail in the UHD footage (left) compared with the 1080p video (centre). UHD downsized to 1080p (right) looks sharper than the 1080p capture, too

↑ Sony Movie Studio Platinum and Vegas Pro (shown here) both include proxy editing facilities that take the strain off the computer for smoother real-time previews

knocks out a specified colour to reveal a different background. These effects can struggle with complex shapes such as hair, whereby an individual pixel may contain a mixture of hair and green background. Shooting at 4K gives the effect much more detail to work with, so the results look more natural when the picture is scaled down to 1080p after chroma keying has been applied.

Shooting at 4K means you can crop the image by up to 2x during editing and still have enough pixels for a sharp 1080p picture. In effect, that means you can double the zoom range of your lens. It also gives you a little more leeway when shooting, as you know you can crop while editing.

The ability to crop the picture without compromising quality is particularly useful for video stabilisation effects. These crop and pan around the frame to counteract detected shake. It's an essential process for action cams and extremely useful for virtually any handheld footage. Applying it to 1080p footage can take a heavy toll on the clarity of details, but starting with 4K footage means you still have a pin-sharp 1080p picture at the end of the process.

EDITING IN 4K
There are significant benefits to shooting in 4K, but it's when you come to edit your footage that you start to see the drawbacks. The files are huge – the BlackMagic produces almost 1TB of 4K Raw footage an hour. A 3½in SATA hard disk costs around £30 per terabyte, so you could consider using a swappable drive bay as a form of removable storage. This adds a lot of administration to the workflow, though. Also bear in mind that you'd want to keep an archive of your Raw footage so you could take full advantage of its extended bit depth when exporting in HDR formats becomes practical.

Most readers won't be considering a BlackMagic camera, and the kinds of cameras we review at *Computer Shopper* are thankfully more modest in their requirements. Panasonic

and Sony's cameras encode in AVC format at 100Mbit/s, which works out at 750MB per minute or 45GB per hour. That's still a lot of data, but a 4TB disk costs around £120 and would hold about 89 hours of footage, which seems like an acceptable outlay.

You'll probably also want a 4K monitor for editing. I've edited 4K projects on a pair of 1080p monitors – one for the editing software interface, the other as a preview monitor – and while it is perfectly possible, it's much more rewarding to see all those pixels as you edit. While writing this article I used an Iiyama ProLite B2888UHSU, which costs around £350 and made UHD footage look incredibly detailed on its 28in screen. It has a generous selection of inputs, but note that DisplayPort and HDMI 2.0 are the only inputs that supports UHD resolution at refresh rates beyond 30Hz. As such, it might be necessary to upgrade your graphics card to one that has the necessary outputs.

Video-editing really hammers a computer's core components – the processor, RAM and graphics card – and jumping from 1080p to UHD makes the job four times harder. I've got by with 8GB RAM but 16GB is a sensible minimum if you're specifying a new computer. As for the processor, go for the fastest you can afford, but we wouldn't recommend trying to edit on anything slower than a modern Core i5 or i7. Most video-editing software taps into the graphics card's processing power using the OpenCL standard, but their effectiveness in our tests has been varied. Even so, it seems fair to say that a fast graphics card with at least 2GB dedicated memory is recommended.

Adobe Premiere Elements 14 will play UHD footage from the Panasonic GH4 and Sony a7R II smoothly on my Core i7 870 PC. However, overlapping two clips or applying effects caused preview performance to nosedive. Judging by Windows Task Manager, single video streams benefit from hardware acceleration from the graphics card, but adding effects and overlays puts the load

back on to the main processor. A Render button generates temporary video files of any parts of the timeline that include effects or overlays, but these are slow to generate and must be repeated after each edit, so it's not a great solution. Premiere Elements' dual monitor support is clumsy too. In some respects it's extremely powerful, but as part of a 4K workflow I'd say it's only suitable for basic editing jobs.

Sony Movie Studio Platinum 13 was less successful at previewing UHD footage from the GH4 and a7R II, dropping a few frames here and there. However, it includes a proxy editing function that generates 720p copies of the raw footage, and the user can switch between them for previews depending on whether they want smoother playback or sharper detail. It's not at all obvious how to switch between these modes – it's done by selecting Preview or Good in the quality drop-down list above the preview monitor. Movie Studio Platinum also includes proper support for dual monitors, with a second monitor exclusively for full-screen playback.

Sony Vegas Pro 13 delivers the same benefits and includes features that are likely to tempt more ambitious users, such as unlimited tracks, masks and playback speed envelopes. There's also an option to switch from 8-bit to 32-bit floating point colour, which could prove extremely useful if and when the opportunity arises to work with a 10-bit production workflow.

TIME TO UPGRADE?
I'm lucky enough to be able to play with new cameras for a couple of weeks at a time, but even so I haven't yet splashed out on a 4K camera of my own. Yes, the footage from these cameras looks fantastic but for now it feels that those big, cumbersome files aren't necessarily worth the hassle for casual video projects. YouTube makes it easy to publish in 4K, but there can't be many YouTube viewers who own 4K displays. I suspect most people pay no attention to the little cog that lets them check they're tuned in to the highest quality stream. When I manually select 2160p over a fibre broadband connection, I often experience interruptions in playback.

The next time I have an important video shoot on the horizon, however, that will probably be my cue to upgrade. The models currently on offer seem like great value – the Panasonic G7, Panasonic GH4 and Sony a7R II in particular stand out. There's a tangible benefit to shooting at 4K even if it's only ever viewed at 1080p. If and when 4K displays become commonplace, I suspect I'll be grateful that I made the move. ▣

NEXT MONTH

DESIGN A LOGO
Whether you're commissioning a new logo or designing your own, our tutorial will help you consider all the ins and outs

Stream live or recorded TV throughout your home

An inexpensive USB TV tuner can transform your NAS device into a TV streaming and recording hub. **Clive Webster** shows you how

THERE'S NO DOUBT that mid-December to mid-January is good TV season in the UK. But what do you do when Auntie Vi wants to watch *Strictly*, the resident teenagers would rather see Britain's Got the X-Factor Live, and Grandpa insists that *The Great Escape* is an unavoidable tradition? Rather than buying a new TV (and installing new aerial points), just bag yourself a USB TV tuner or two. Plug them into your NAS and you can stream live TV or recordings to every networked device in the house. Then all that's left to argue about is who 'accidentally' lost the Monopoly set.

Most major NAS manufacturers provide some kind of USB TV tuner support, but as we've tended to recommend Synology NAS devices in the past, we'll focus on Synology's software. First, check which TV tuners your NAS supports by visiting *www.synology.com/ en-uk/compatibility* (select 'DTV dongle' in the Select Category menu). We recommend using a device listed in the Compatible Models list, but check for any caveats to the support in parenthesis (such as 'single tuner' or 'DVB-T source only'). Finally, if you have to buy a new USB TV tuner, consider getting a dual-tuner model. These should cost around £60 and will allow you to record or live-stream two channels simultaneously.

Once you have a USB TV tuner, plug it into a spare USB port on your NAS. If there's no aerial point nearby, consider moving the NAS and using a HomePlug set or a spare router (the one supplied by your ISP, for example) to keep the NAS connected to your network. Failing that, a 20m aerial cable should cost around £7 while 20m of Cat 5e or Cat 6 Ethernet cable will cost roughly a pound more. Once everything's plugged in, log in to your NAS and install Video Station.

VIDEO STATION

Synology's approach to NAS-based TV support is to shove it into its general-purpose video app as an extra feature, which can lead to confusion. For example, when you launch Video Station (by clicking the icon with four squares on the main menu) it warns you that no indexed folders have been created. The folders it means are for the downloading and streaming of video files archived to the NAS, and can't be used as a recording location.

Click the Settings button at the top of the Video Station window and then open the DTV tab. Use the blue Select button to create a folder on your NAS to store recordings (we used /Films/Recorded TV), and scroll through the rest of the settings page to find other useful options. For example, because our test NAS is quite old, we limited the number of live streams to one, prioritised recording over live-streaming and adjusted the pre-record length to 120 seconds (two minutes before

Bag yourself a USB TV tuner or two, plug them into your NAS and you can stream TV to every device in the house

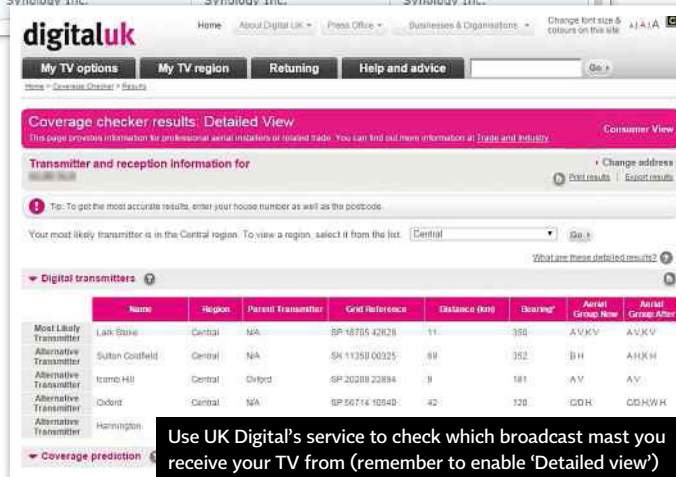the show is due to air, in other words). Click OK to save these settings.

Now click the DTV section in the left-hand pane of Video Station. You'll be warned that "No channel exists. Please perform a channel scan first." Check that your TV tuner is named in the right-most drop-down menu at the top of the Video Station window (our PCTV NanoStick T2 290e was referred to as a 'PCTV 290e') and click the warning. You'll need to tell Video Station your location – both the country and the name of the broadcast mast

you use (visit *www.digitaluk.co.uk/ coveragechecker*, and tick the 'Detailed view' box to find yours). Once you've entered this information, Video Station will scan for TV channels, a process that took ages on our aging Synology DS211j NAS. Our combination of hardware didn't recognise the holding pages of BBC Four, BBC Three, CBeebies and CBBC (and their HD variants), so we re-scanned after 7pm.

Once the scan is finally complete, you may want to remove unwanted channels, such as the 20-odd radio stations, the shopping and holiday channels, any 'adult' channels and probably ITVBe. Click the Edit Channels icon to see a list of discovered channels. Use Alt-click to group-select any you don't want, then click the Delete button. You'll be asked to confirm their deletion. Now that you've trimmed the list, you might want to reorder it by clicking and dragging entries up and down. Once you're happy with it, click Done.

If you want to schedule recordings, the best option is to use the Video Station app on your NAS, as the mobile app is a little clunky for this task. If you know the name of the

Video Station handles TV recording and live-streaming on a Synology NAS. Most other NAS manufacturers have an equivalent app

recordings, which is possibly the least useful way to filter the videos. Choose 'All' videos from the options on the left-hand pane and you can watch TV recordings as you would any other video stream from your NAS. Our app even offered to live-stream TV from the NAS, although we couldn't get this to work. Usefully, however, DS video is one of the few streaming apps that lets you 'seek' forward and back through a video to skip ads or repeat a bit of dialogue you missed.

The DS video mobile app isn't as streamlined as its smart TV counterpart, with features and options crammed together in a way that's not always logical. It's worth persevering, though, as there are useful options to be found. Thankfully you can auto-scan your network to find your NAS, and typing the NAS's log-in credentials is easy using the onscreen keyboard. As you'd expect, DS video can stream TV recordings to your mobile device of choice (as well as

programme or film, click the Recording Schedule icon and then the Program Guide tab. Once this page loads, you'll see the search field in the top-right. Type your search term, hit Enter and a list of results should appear. Click on a result to highlight it, click the Record button at the top and select Record on the menu that appears. You can set up a repeat schedule to record subsequent episodes of a show, but you have to enter the end date manually and we're not convinced Video Station can update the schedule to accommodate shifting broadcast times, such as those of *Doctor Who*. If you want to record an ongoing show you're best off using your PVR. We typically had access to only three or four days of listings, too, so you'll want to repeat this process at least twice a week.

The other way to schedule a recording is to hover your mouse over the channel name, which reveals three icons: Live stream, Record and Open program guide. The first two are self-explanatory, while the latter opens the listings for that channel, allowing you to hunt down that programme that you know is on BBC Two tonight but can't quite remember the name of.
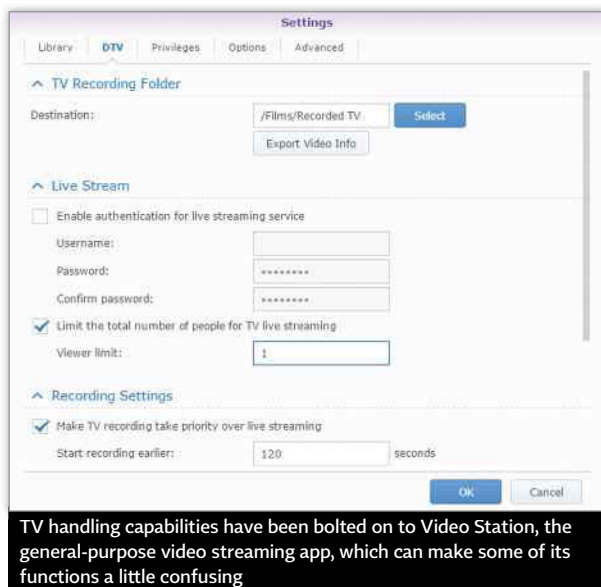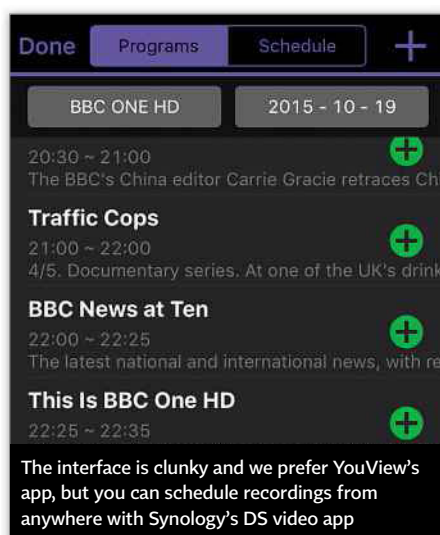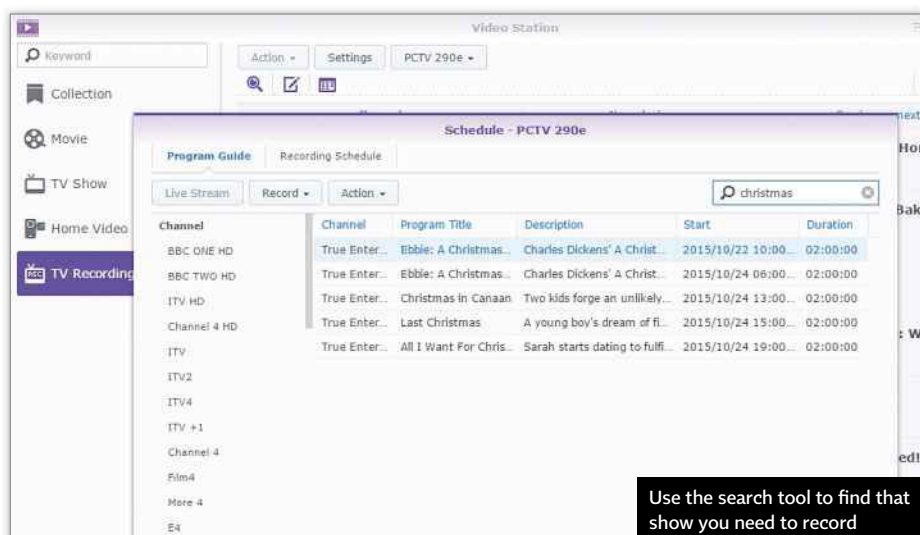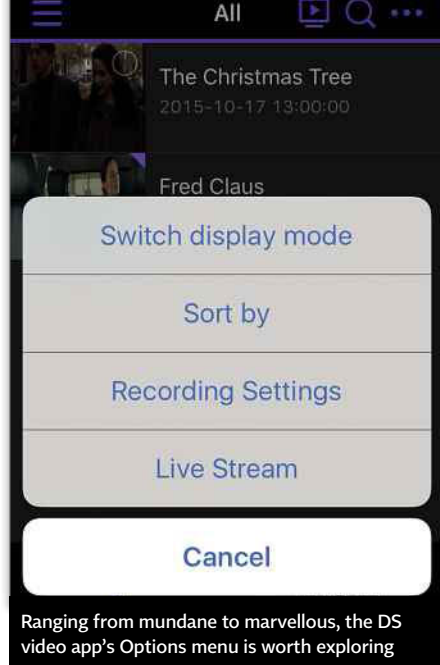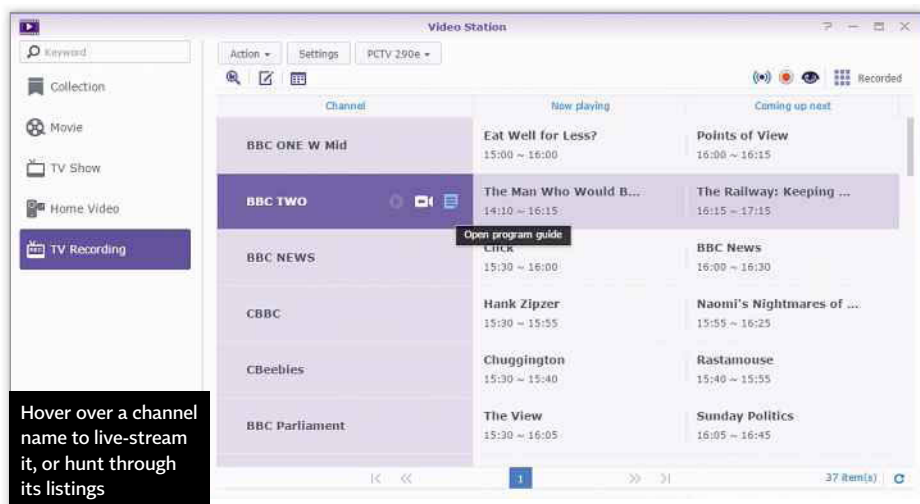
DS VIDEO APP

The DS video app is available on Windows Phone, iOS and Android, and also as a free download for many smart TVs, Blu-ray players and streaming boxes. We'll deal with the TV-based app first as it's the easiest to use.

As with Video Station, the TV capabilities of DS video have been bolted on to a general-purpose video-streaming app. Once you've got over the anachronistic hurdle of logging into your

Use UK Digital's service to check which broadcast mast you receive your TV from (remember to enable 'Detailed view')

NAS by typing in its IP address and log-in credentials, however, DS video is easy to use: just scroll through the carousel of options until you find TV Recordings. Hit enter on your remote and you'll be taken to a list of your recordings. On our Samsung Blu-ray player, this list defaults to your 'Last viewed'

TV handling capabilities have been bolted on to Video Station, the general-purpose video streaming app, which can make some of its functions a little confusing

other video stored on your NAS), and can even download these video files to your phone or tablet. Open the main menu (see the annotated screenshots opposite), select TV Recordings and you'll see your recordings (iOS defaults to 'All' while Android defaults to 'Just Watched'). If you have lots of recordings, the magnifying glass will help you search for a specific video, while the screen with a 'play' arrow launches the 'Remote Player' function, turning your mobile device into a remote control for the DS video app installed on your TV, Blu-ray player or streaming box.

The Options menu (three dots) offers choices that range from trivial to intriguing: 'Switch display mode' and 'Sort by' are mundane but 'Recording Settings' lets you schedule recordings on your NAS or adjust the settings of already scheduled recordings. Scheduling new recordings is a clunky process that involves selecting a channel and a date using buttons and carousels, then scrolling through the channel's listings to find the show you want before pressing the big green cross button to record it. However, if you set up remote access (in the same way we did when we used DS audio to create our own music streaming service – see *Shopper* 334) you can schedule recordings from anywhere in the world that has reasonable data

Hover over a channel name to live-stream it, or hunt through its listings

Ranging from mundane to marvellous, the DS video app's Options menu is worth exploring

Use the search tool to find that show you need to record

The interface is clunky and we prefer YouView's app, but you can schedule recordings from anywhere with Synology's DS video app

reception. The last option, Live Stream, is the most controversial as it lets you stream live TV to your mobile device – in the case of BBC television, this might breach the terms of your TV licence even if the stream isn't blocked because your device has a non-UK IP address.

If you're recording something truly unmissable, we'd still advise you to use a PVR as we're not completely convinced by the reliability of Video Station (at least, not the way it runs on our five-year-old NAS). Even so, NAS-based TV is a versatile secondary system, as well as a cheap and relatively straightforward way to keep everyone happy over the Christmas period – at least as far as TV viewing is concerned. ▣
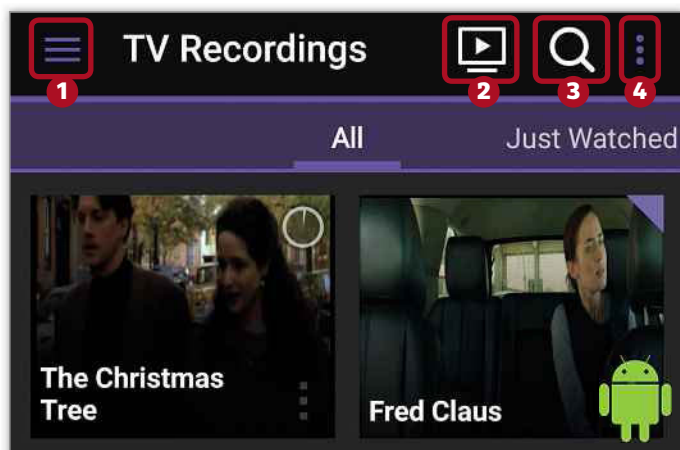
NEXT MONTH

TURN YOUR RASPBERRY PI INTO A REAL PC
With the latest version of the Raspberry OS and some tweaks, you can turn your Pi into a real PC. We show you how
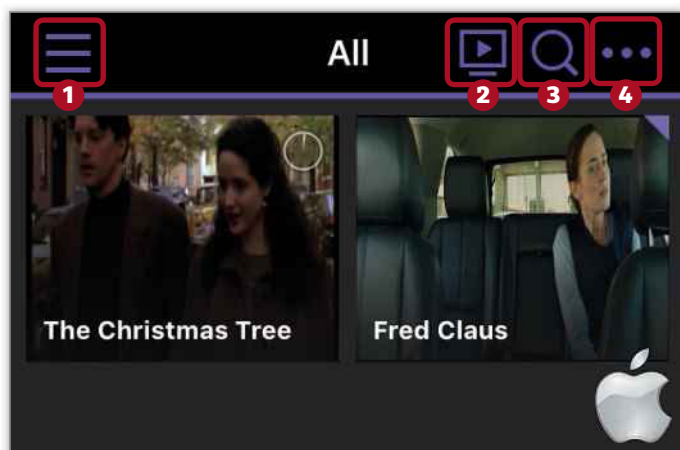
The mobile version of DS video is hardly elegant, with useful options hidden in illogical places and features that are tricky to use. Some patient experimentation can yield rich rewards, however:

❶ Main menu: use this to switch between TV-based and other videos, and to access Settings.
❷ Remote Player: this lets you control the TV-based DS video app with your mobile device.

❸ Search: here you can search your recordings but not the channel listings.
❹ Options: rearrange your recordings, modify scheduled recordings or set new ones here.

Zygote

With car manufacturers faking emissions tests, putting driverless lorries on our motorways and sacking workers for watching porn, **Zygote** has one more for the road

BOG STANDARD

There's a brand-new app for people who don't know if they're coming or going. It works with a discrete wireless device called the D-Free, and you simply slap a little sensor over your belly button, fire up the app, and let nature take its course.

D-Free uses ultrasound to monitor your gurgles and windy emissions, and it also keeps a detailed dairy of your bladder and bowel events. According to the publicity bumph, "it knows when you need to go, so you can maintain human dignity, ignore your body's signals and let your smartphone do all the work".

This means the D-Free emits a 10-minute warning when it thinks you need to nip off and find the nearest bog. It also stores details of every pee, poo and parp you emit on its database.

Zygote sincerely hopes this marvellous device can be connected to our Facebook pages, allowing us to add news of our bodily wastes to the rest of the crap on there.

SUCKERS

Zygote is not in the slightest bit surprised by all the hullabaloo concerning fake tech statistics. Hot on the heels of the Volkswagen emissions scandal there's been a slew of similar revelations. The Energy Savings Trust has found around 40 per cent of household products have suspect environmental or energy ratings, covering everything from TVs to tumble driers. Recently Dyson began legal proceedings against Bosch and Seimens for allegedly cheating in energy-efficiency tests on smart vacuum cleaners. Dyson accused the companies of installing sensors that maintain low power mode under test conditions, whereas in the real world the machines draw double the power.

The only thing that does surprise Zygote is the discovery that so few of the manufacturers' claims are hooky. If it's got a computer on board then the software can be rigged to skew results under test conditions. And if the software can be rigged then some bright spark is going to rig it. One thing is certain, it's feast time for the lawyers.

SWEET TALKING

With all the calls for a sugar tax to encourage healthy eating, Dutch researchers have developed 3D printed teeth with built-in bacteria busters. The process is surprisingly simple, and involves nothing more than mixing ammonium salts with dental resin polymers.

It seems the bugs that cause tooth decay are negatively charged, whereas the salts are positively charged, and so fight the rotting process. And exactly the same anti-bacteria salts can be used for food packaging, which means there will be no need to unwrap our sweets and snacks in the future because we can eat the lot. Zygote hopes the wrappers are tastier than most of the sickening content.

TRUCK OFF

The era of the self-driving car on our public roads has been with us for about a year now, but it's only been in the past couple of months that robot lorries have dispensed with human drivers. Highway Pilot is the name of the system for computer-controlled heavy goods vehicles, and unsuspecting motorists on the Autobahn between Denkendorf and Stuttgart Airport may be surprised to see a 12-litre Mercedes-Benz juggernaut cruising along at 80kph with nobody at the wheel.

"Highway Pilot does not replace the driver," according to a statement from manufacturers Daimler, "but simply relieves the strain on them by driving on monotonous stretches and taking care of annoying stop-and-go driving in traffic jams." In other words, "Highway Pilot *does* replace the driver".

Zygote awaits the first report of an automated lorry pulling into a motorway service station for a slash.dot.com, having sex with a compliant charging point, then driving off with half a dozen illegal workstations in the back.

CASHING IN

Microsoft values the Apple operating system more highly than its own, and Zygote can prove it. In a recent effort to bribe UK consumers to part with their old systems in exchange for a new Windows 10 machine, Microsoft offered £100 cashback on products costing over five hundred quid. Lesser inducements were dangled for cheaper machines, all the way down to £30 against an entry-level rig.
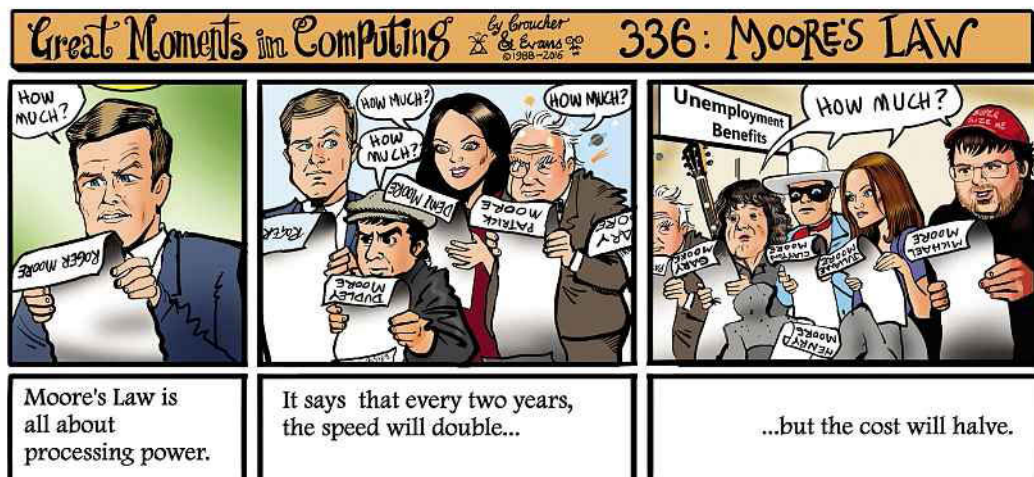
Meanwhile, across the pond in America, the bribery was even more generous, or should that be desperate. Bemused punters were offered a hefty $200 cashback on any Windows machine over $500, but if they had an old MacBook knocking around, Microsoft was prepared to up the trade-in to a massive $300 bribe against a Windows 10 device. What more evidence do you need as to what the folk at Redmond HQ really think?

Z CARS

A car worker referred to as Joseph Z was caught watching porn on a laptop by his employers at the Fiat factory in Palermo, Italy, while the assembly robots did all the work. Fiat sacked him.

But instead of slinking away in shame, Signor Z claimed he had been unfairly dismissed and took his case to the local Sicilian court. They upheld the dismissal and told him to get lost, but he elevated the case to the Court of Appeal and finally to Italy's Supreme Court, who have now declared his dismissal as unlawful because "there is no evidence that Joseph Z had not watched the material during his lunch break". Zygote advises all Fiat drivers to check their nuts immediately.

Great Moments in Computing — by Croucher & Evans — 336: MOORE'S LAW

Moore's Law is all about processing power.

It says that every two years, the speed will double...

...but the cost will halve.

PROLITE
XB2481HS | SEE ALL THE SHADES OF GREY

Prolite XB2481HS: Slim bezel monitor with height adjustable stand and 3 000:1 static contrast, ideal for multi monitor setup.

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